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Crystal Tissue Co. Installs New 60,000 lb. Per Hour High Efficiency Steam Unit

Prior to the installation of a new steam generating unit in the boiler plant of the Crystal Tissue Company, Middletown, Ohio, the steam generating equipment consisted of three H.R.T. boilers, and two bent-tube boilers of 350 hp. each. The boilers were stoker fired and while the overall efficiency of the steam generating plant could not be considered unusually low for the type of steam generating equipment installed, a survey made last year showed that steam costs could be substantially reduced with the installation of a high efficiency steam generating unit of modern design and of a capacity to deliver all steam required for the plant. The survey further showed that the initial investment for the installation of the new steam generating equipment would be returned out of fuel savings within two and one half to three years on the basis of 84 per cent average boiler efficiency.

To permit the use of present steam piping, valves and low pressure prime movers, it was decided to operate the new unit initially at 200 pounds pressure and 500° steam temperature at the superheater outlet. Considering, however, that in the future the installation of a higher pressure turbine generator set might become advisable, it was decided to construct the unit for future operation of 448 pounds pressure and 650°F. steam temperature at the superheater outlet.

Decided To Install New Unit

Space could be provided for the installation of the new unit by removing the two oldest H.R.T. boilers. With these boilers removed, the available space for the new unit was 17 feet wide, 33 feet from front to rear and 31 feet high. The steam demand of the plant for a 24-hour working day averages 50,000 pounds per hour. It was decided, therefore, to install a new unit of a continuous maximum capacity of 60,000 pounds of steam per hour, designed for normal continuous operation at 50,000 pounds per hour, at which point the unit is to operate at its best efficiency of approximately 85 per cent.

In view of the fact that the remaining stoker fired bent tube boilers of 350 hp. each, and the Murphy furnace fired H.R.T. boiler would not provide sufficient standby capacity to maintain the required steam output during the time that the new unit is out of service, much thought had to be given to the selection of the best suitable unit from the various designs submitted by boiler manufacturers. A forced shutdown of the new unit would result in serious curtailment of plant production. The unit so designed that rapid, unrestricted circulation is maintained in both boiler and water wall systems over the entire load range, gave the best assurance of absence of boiler and water wall tube failures. To further assure continuous operation, pulverized coal was selected for firing this unit. The coal available is Cabin Creek coal coming from the Dorothy Mines. Its analysis as fired is:

Moisture	3 per cent
V. M.	33 per cent
F. C.	56 per cent
Ash	8 per cent
Heat value	13,500 BTU's per pound
Ash softening temp.	Approx. 2600°F

Considering the comparatively high ash softening temperature, a completely water-cooled furnace was not considered necessary. The specification, therefore, called for a flat refractory furnace floor and water cooled furnace side walls, with the water cooling area sufficient to keep the furnace temperatures below 2400°F. at highest steam output.

The unit installed consists of:

Boiler heating surface	6,470 sq. ft.
Water wall heating surface	975 sq. ft.
Airheater surface	6,000 sq. ft.
Furnace volume	3,800 cu. ft.

Superheater for 500°F. temperature at 175 pounds pressure.

Ring Flow Circulation Boiler

The boiler is of the well-known ring flow circulation type, with one 48-inch diameter steam-water drum; two 36-inch diameter submerged drums, and one 36-inch diameter dry steam drum. The water wall system is directly connected into the boiler circulating system so that rapid and unrestricted circulation is maintained at all load points without the use of recirculators.

A multiple loop superheater is placed between the boiler tubes, with the inlet ends of the superheater elements rolled into the shell of the dry-steam drum.

The airheater is a two-pass tubular type with gases and air in counterflow. The airheater is designed for high gas flow velocities, so that the inside of the airheater tubes, through which the gases pass, is kept automatically clean by the scrubbing action of the gases, thus eliminating the necessity of soot blowers.

The furnace is water-cooled on two sides and front, with widely spaced bare water wall tubes. The first row of boiler tubes form a water-cooled rear wall for the furnace. Front and sides of the unit are closed in by a brick setting,

New York: E. P. Lawson Co., Inc. Chicago: Chas. N. Stevens Co., Inc.
San Francisco: Harry W. Brintnall Co.
Atlanta: J. H. Schroeter & Bro., Inc.
Toronto: The J. L. Morrison Company

consisting of 22½ inch thick firebrick walls. These walls are, of course, efficiently cooled by the water wall tubes, and maintenance of furnace brickwork is expected to be negligible. The rear wall of the setting is formed by the airheater casing. Ashes are being removed from the flat furnace floor manually and through large ash doors placed in each side of the furnace.

A single flare type, pulverized coal burner is provided in the furnace front wall. All air for combustion is introduced with the fuel through the burner opening. The pulverizer is directly connected to the single burner and is a high speed Atrita mill with a capacity of 6,000 pounds of coal per hour. The pulverizer is driven by a 60 hp., 1160 R.P.M. constant speed motor, direct connected to the pulverizer shaft.

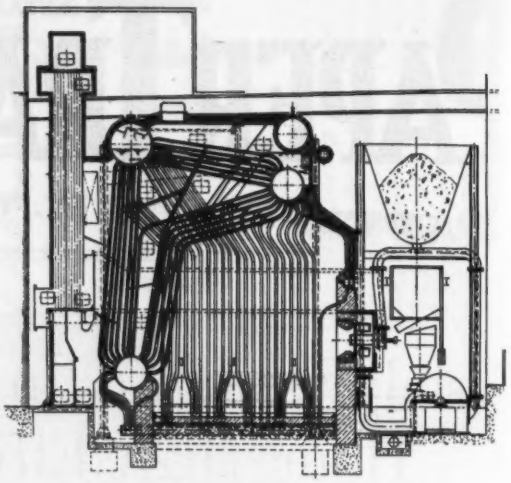
An auxiliary steam turbine drive is provided on a shaft extension from the pulverizer for starting up the mill when no electrical power is available. For this purpose also, a natural draft by-pass connection has been made between boiler and existing brick stack. This permits starting up of the large unit and operating the unit at low loads without the use of forced and induced draft fans or any other motor driven auxiliaries.

The exit gases from the airheater are discharged through an induced draft fan into the existing stack. This fan has a capacity for handling 90,000 pounds of gas per hour at 325°F. and 5.2-inch static suction. The fan is direct-connected to a 40 hp. variable speed motor. All air for combustion is delivered by one forced draft fan to the airheater. This fan has a capacity of 75,000 pounds of air per hour at 70°F. and 6-inch static pressure. It is direct connected to a 25 hp. variable speed motor.

All fans and the pulverizer are placed on the operating floor, so that they are readily accessible for ordinary maintenance and service.

While it has been necessary to place the new equipment into a very restricted space, nevertheless, the arrangement of the equipment is quite comfortable.

The new 60,000-pound per hour steam generating unit is being operated for 24 hours a day, from early Monday morning until noon Saturday, at an average load of 50,000 pounds of steam per hour with occasional peaks of 60,000 pounds steam per hour. The unit is off the line Saturday afternoons and Sundays. During this period the small



Sectional Side Elevation

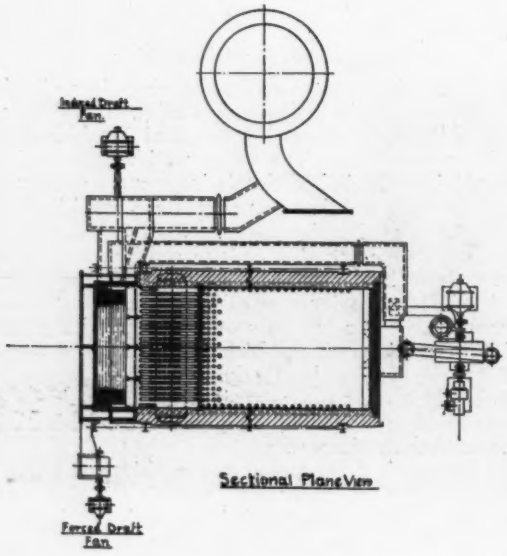
H.R.T. boiler furnishes sufficient steam for plant heating and small auxiliaries. During the five and one-half working days, the new steam generating unit is the only boiler in service and is carrying the entire plant load.

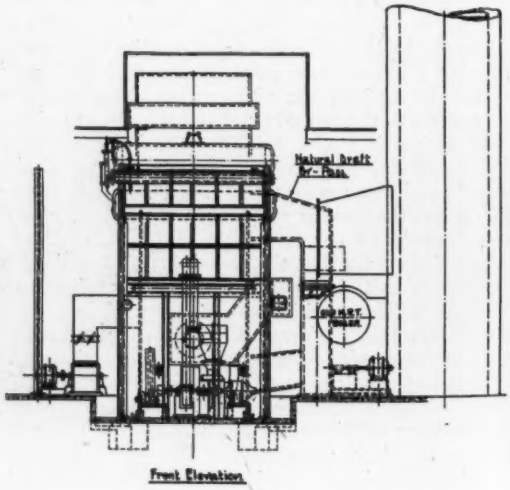
Performance Results Meet Expectations

This new unit was placed in service approximately three months ago. Performance results obtained during this period fully substantiate the manufacturer's guarantees and the expectations of the engineers. It is to be noted that these results are being obtained by the original operating crew who have had no prior experience in pulverized coal fired high efficiency steam generating equipment. The design and installation of the new steam generating unit were made under the supervision of W. I. Barrows, consulting engineer, Dayton, Ohio.

PRINCIPAL EQUIPMENT

Boiler: 6,470 sq. ft. ring flow bent tube type	Riley Stoker Corp.
Water walls: 975 sq. ft. bare tubes	Riley Stoker Corp.
Superheater: Multiple loop type	Riley Stoker Corp.
Airheater: 6,000 sq. ft.; Two-pass, tubular	Riley Stoker Corp.
Setting	Riley Stoker Corp.
Insulation	Eagle-Picher Lead Co.
Pulverizer: Atrita type for 6000 lb. coal per hr.	Riley Stoker Corp.
Burner: Flare type turbulent flame	Riley Stoker Corp.
Forced and induced draft fans	B. F. Sturtevant Co.
Electric motors	General Electric Co.
Soot Blowers for boiler	Diamond Power Specialty Corp.
Safety valves and steam gages	Consolidated-Ashcroft-Hancock Co.
Water column and Blowoff valves	Yarnall-Waring Co.
Feed water and miscellaneous valves	Edwards Mfg. Co.





Weyerhaeuser Sulphite Pulp Mill at Everett, Wash., To Start Operating in Spring

On the site formerly occupied by its first West Coast lumber mill the Weyerhaeuser Timber Company is having erected at Everett, Wash., the second of its sulphite pulp mills.

To Produce West Coast Hemlock Pulp

Like the company's original pulp mill at Longview, Wash., which started operations late in 1931, the new Everett plant will produce West Coast Hemlock pulp. Unlike the Longview plant, the Everett mill will not make bleached pulp; its output will be exclusively unbleached.

The Everett mill will be completed, it is expected, late this year and will be in operation before next spring.

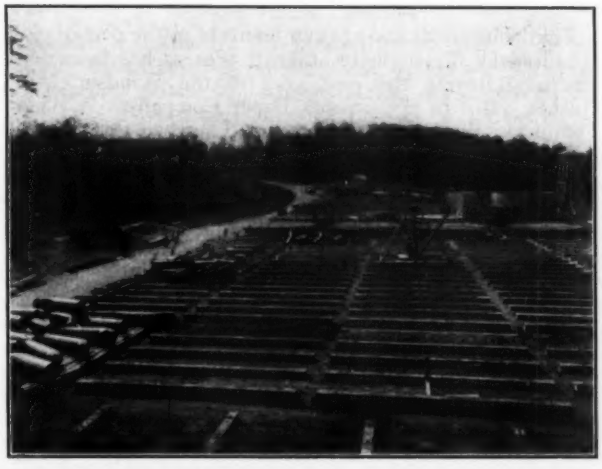
To Embody Important Innovations

The design of the new mill was naturally influenced to a large extent by the design of the Longview plant and the experience accruing during its operation. In many respects the plants will be similar in equipment and operating methods. The Everett mill, due to the designers' ingenuity and to the experience of the Longview mill operators, will embody a number of important plant and operations innovations which have been proved practical by extended experiment and tests in miniature testing operations set up at the older plant. Complete details of these innovations are to be revealed as soon as the new mill is in operation.

Everett, a "Natural"

The site for the new mill at Everett was selected because it is a "natural" from the standpoint of Hemlock log supply, water sources, and shipping facilities by rail and ocean-going vessels. Logs are brought to the mill along with logs for the two Weyerhaeuser lumber mills at Everett by rail and raft from the company's nearby logging operations.

Everett is on Puget Sound which is navigable by ocean vessels. The pulp mill will have its own private dock where Weyerhaeuser and other vessels will be loaded.



THE PHOTOGRAPH SHOWS THE FOUNDATIONS FOR THE SETTLING BASINS OF THE FILTER PLANT. WATER FLOWS INTO THE PLANT BY GRAVITY FROM RESERVOIRS WHICH ARE FILLED BY NEARBY MOUNTAIN STREAMS. THE FILTER PLANT IS SEVERAL HUNDRED FEET ABOVE THE PULP MILL WHICH IS LOCATED ON PUGET SOUND.

Water for the mill's use comes from mountain streams. A new modern filter plant is being erected two hundred and forty feet above the pulp mill thus assuring a constant head on the mill floor.

Financing Mutual Pulp & Paper Mills

VANCOUVER, B. C., October 26, 1935—Final details in connection with financing of the Mutual Pulp and Paper Mills of Prince Rupert, Ltd., are now being completed in Chicago by F. L. Bucklev of Vancouver, Canadian principal in the new pulp and paper company which has purchased a large site at Prince Rupert for its new plant.

CONSTRUCTION OF THE WEYERHAEUSER SULPHITE PULP MILL AT EVERETT, WASH., IS PROCEEDING RAPIDLY. THE PHOTOGRAPHS SHOW PART OF THE BUILDING OPERATIONS.

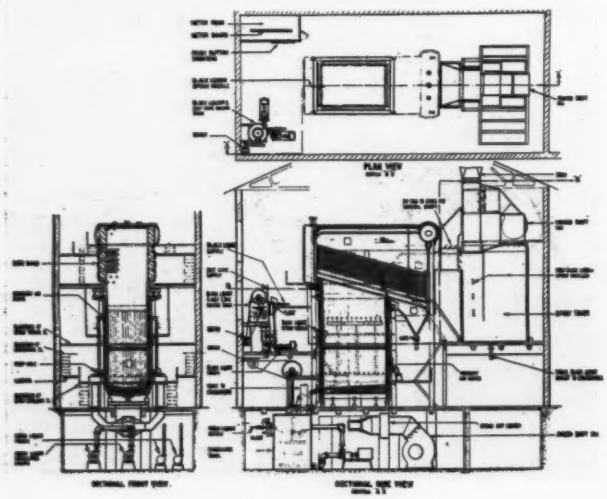
B & W-Tomlinson Black Liquor Recovery Process At Windsor Mills

That substantial savings can be made in the cost of pulp produced by the sulphate or kraft process has been demonstrated during the past year at the Windsor Mills, Quebec, plant of the Canada Paper Company. A B&W-Tomlinson Black Liquor Recovery Unit has for the year carried the entire recovery room load of the mill, which, at the present time, is that resulting from the production of approximately 75 tons of air-dried pulp per day. The major accomplishments of the unit are: improved recovery of chemicals and maximum recovery of heat, with minimum requirement for labor, maintenance, and space.

Tests made under actual service conditions have shown that the average chemical reduction is between 90 and 95 per cent and that the recovery of chemical is 95 per cent. The unit delivers 10,000 pounds of steam from and at 212 degrees Fahr. per ton of pulp. It is operated by only one man, with another man for such part-time work as water tending and tube blowing. Actual results show that the maintenance cost to date has been negligible and indicate a figure in the neighborhood of five cents per ton as a reasonable estimate for maintenance of the unit when operating under average and normal conditions.

Design of Recovery Unit

The design of the B&W-Tomlinson Recovery Unit differs considerably from that of other units for this purpose. The equipment consists of a completely water-cooled furnace, directly over which is set a standard B&W Cross-Drum Boiler and behind which is located a spray tower. Depending upon the economic conditions at any particular plant, the unit may also be equipped with a superheater, an economizer, and/or an air heater, with equivalent results in so far as recovery and reduction of chemical are concerned, but with increased production of steam per ton of pulp. The unit is equipped with meters and controls whereby operation can be governed simply and effectively from the operating platform.



GENERAL ARRANGEMENT OF RECOVERY UNIT

In operation, the weak liquor as it comes from the washers, at about 15 per cent solid concentration, is circulated through the spray tower, where it is brought into intimate contact with the hot gases from the boiler and becomes more concentrated. This liquor then flows through multiple-effect evaporators in which the solid concentration is increased to approximately 55 per cent. Salt cake is then added to and mixed with this black liquor, which, with the salt cake in suspension, is sprayed into the furnace under pressure by means of a specially designed nozzle located in the uptake wall of the furnace. This nozzle, or sprayer, is so arranged as to provide a horizontal spray of fairly coarse particles, which impinge on the side and rear walls of the furnace. In their passage across the furnace, the particles of spray are partially dehydrated and, upon impingement on the furnace walls, accumulate in the form of porous char to an average thickness of approximately 12 inches. When the char has built up to this extent, it breaks off because of its weight and falls in lumps onto the hearth of the furnace. There it builds up in a bed extending to about the level of the primary air ports, which are distributed evenly along both sidewalls and the rear wall of the furnace. Secondary air is admitted above the char accumulations on the walls. The total quantity of combustion air admitted to the furnace is regulated by remote control from the operating platform, and close adjustment of air distribution to different portions of the combustion zone may be accomplished by means of dampers in individual air ports.

The hearth is so designed that the smelt drains immediately through the spout to the dissolving tank.

A Noteworthy Feature

A noteworthy and novel feature of the furnace construction is the design and location of the primary air ports. These terminate in the plane of the furnace-wall cooling tubes, obviating the necessity for water cooling and eliminating any hazard due to the presence of water-cooled tuyeres extending into the active zone of combustion of the char on the furnace hearth.

This process is also applicable to the recovery of chemicals and heat from soda black liquor, requiring only minor changes in the unit as applied to the kraft pulp process.

Dandy Rolls for News and Kraft

Dandy rolls are being used more and more on news, kraft, and other similar grades of paper according to Jos. J. Plank & Co., of Appleton, Wis., who have installed their new Trunnion Type Rolls on many machines making these grades.

The open end dandies, running on a new type of spring cushion stand, permits the installation of two or more shower pipes inside the dandy close to the inner rim. The proper adjustment of these shower pipes keeps the covers free from stock accumulation and in many instances a roll never needs to be removed from the machine for cleaning.

The Plank Company manufacture every type of dandy roll for watermarking as well as rolls for fast running machines.

Fort Howard Paper Co., Green Bay, Wis. Modernizes Its Power Equipment

Until 1928 the Fort Howard Paper Company, Green Bay, Wis., purchased all electric power from the central station and the two machines were driven by engines. At that time a turbine building was constructed adjoining the boiler house and in this building were installed a 1,500 KW extraction condensing turbine, together with a synchronous motor driving two DC generators for the machine drives. In the construction of this building provsion was made for the installation of a second turbine, and the space was temporarily occupied by a non-condensing turbine set of 100 KW capacity.

In the following year there was installed in the existing boiler room a bent tube boiler rated at 700 hp. and provided with an underfeed stoker. This boiler was designed for working pressure of 425 lbs. and equipped with a superheater to give a total temperature of 600 degrees. This boiler with a natural draft stack ordinarily carried a load of 35,000 to 40,000 lbs. of steam per hour.

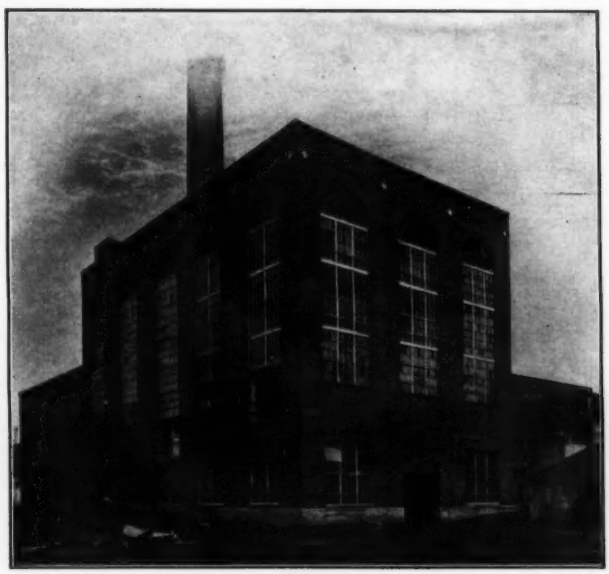
New Turbine Installed

Within five years the load on this plant had increased so that both generator and steam plant were operating considerably above their design point, with every prospect for an additional increasing load. It was decided to install a larger turbine unit and an additional boiler, generally along the lines contemplated when the first turbine went in; a turbine was purchased and installed in the existing turbine room and an addition was constructed on the boiler house to contain the new boiler.

The new turbine unit has a 3,000 KW capacity. It is operated as a single extraction condensing machine, extracting at drier pressure. The design of the turbine provides for the future installation of a second extraction valve should development ever require it. The full load steam rate of this unit is 12 lbs. per KWH.

The New Boiler

The new boiler is of the same type as the one installed in 1929 but contains 10,000 square feet of boiler tube surface. The furnace width is 18 feet. The boiler is provided with an underfeed stoker, having a deep pit and crusher rolls. The side walls of the furnace for about 42 inches above the grate line are water walls protected with blocks. A water wall extending from the muddrum to the bottom of the ashpit is also tube faced with blocks up to the top of the fuel bed and bare above. The design point of this unit is 100,000 lbs. per hour. The load during the first year operation has generally been between 60,000 lbs. and 70,000 lbs. Additional construction in the mill itself, will undoubtedly increase the steam demand materially during the coming winter.



NEW POWER HOUSE OF FORT HOWARD PAPER CO.

Boiler House Extended

Although the boiler house for the new unit is an extension of an existing building and, as shown in the accompanying photograph to be of the same general appearance, it was necessary to provide a much higher basement for the new type of stoker than was available in the old building. Accordingly, the firing floor in front of the new unit is five feet higher than the main floor of the old building. The four interior columns of the new structure carry roof, coal bunker and floor, and at the same time, are the boiler columns. The basement height of 20 feet permits the removal of ashes by means of a truck driven below the bunkers under the crusher rolls. A forced draft fan located under the firing floor discharges directly into the wind box with a minimum of ducts.

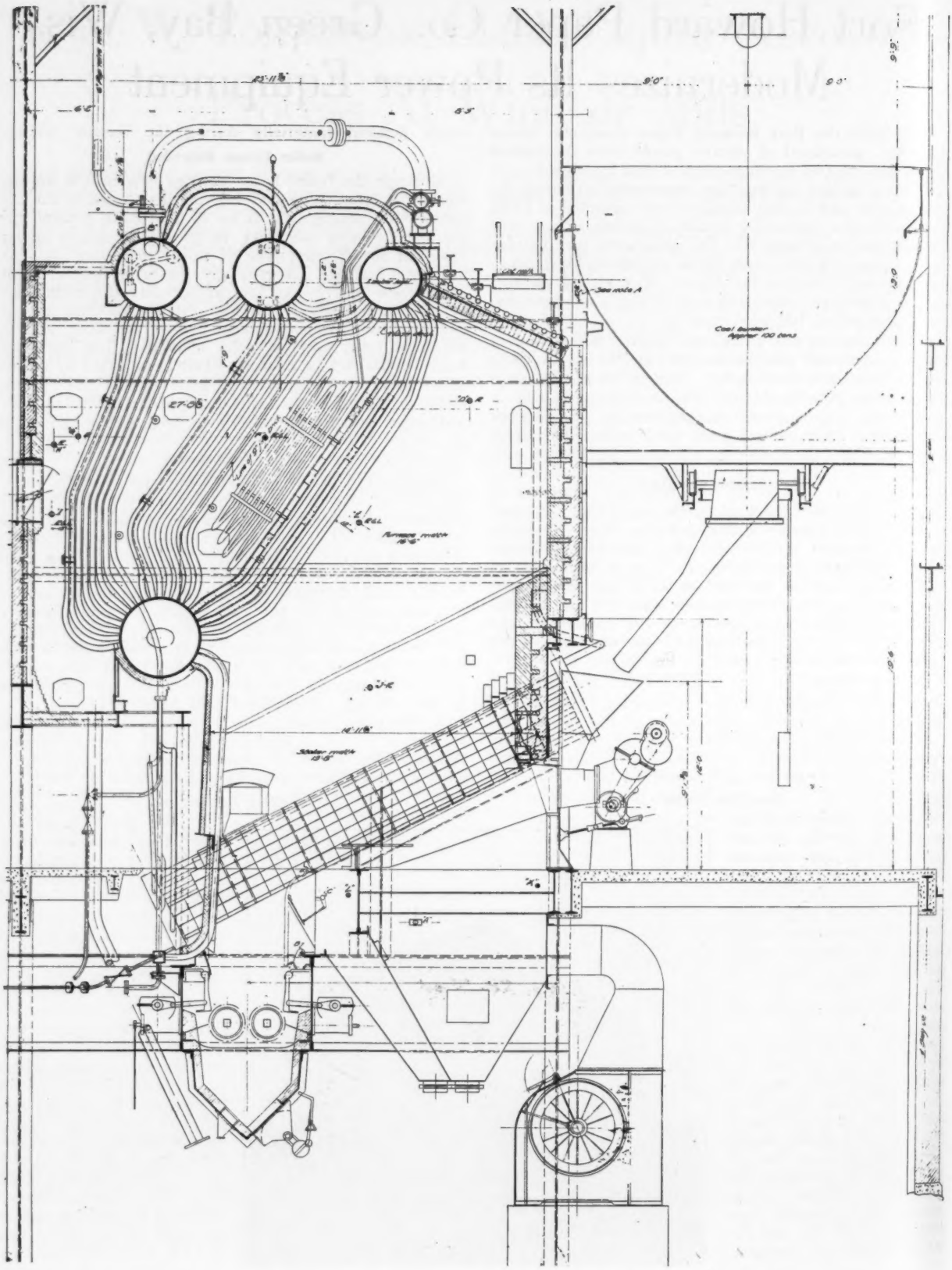
Boiler Performance

The performance of the boiler unit over nearly a year's service has been most satisfactory. Coals of all types ordinarily shipped by the Lakes are available, and while ordinarily a small preparation of high grade coal from the Allegheny districts is burned, the unit has given a good account of itself with a number of different Lake coals. With a load of 60,000 lbs. the operation of this unit is generally between 80 per cent and 85 per cent efficiency as indicated by the normal plant records. All coal for the new boiler moves over a weigh larry. The output of each boiler is recorded on a steam flow meter and these meters are checked against the records of a Venturi type meter in the feed line. No official tests have been made.

As this plant is located on the navigable portion of the Fox river, coal is normally delivered by lake carriers to the Fort Howard dock. Coal is sometimes received from one of the neighboring docks and delivered by truck.

Installing Economizer

In the planning of the boiler house addition, space was left for the installation of either an economizer or an air pre heater. None of this equipment was purchased as it was not believed that the boiler load would be large enough to make such an installation immediately advantageous. However, as soon as ample power was available, the mill load increased to a point where heat reclamation would be profitable. Accordingly, there has been purchased an economizer to be set behind the new boiler with an overhead induced draft fan. This equipment has not yet been shipped but will be available for installation late in 1935. This economizer will be available with either of the two boilers described.



LAYOUT OF NEW POWER UNIT OF FORT HOWARD PAPER CO.

The increasing load, while well within the economical range of the largest boiler, is already 300 per cent of the rating of the smaller boiler. While adding perhaps 5 per cent to the efficiency of the larger unit, the saving will be still greater at such times as the small unit is on the line. During ordinary operations only one boiler is in service.

Electric Equipment

At this mill three phase current is generated at 440 volts, and 60 cycles. The main switchboard, located in the basement of the turbine building, consists of air circuit breakers and disconnect switches. The board in the turbine room contains indicating and recording meters with the control switches operating the breakers on the lower board. Current is taken from the generator terminals on the basement ceiling to the main bus. The small generator is connected by means of cable in conduit but the 5000 amperes of the new unit are carried on bars on ceiling supports and protected by a transite box. Current is distributed by means of lead cables running underground from the main board.

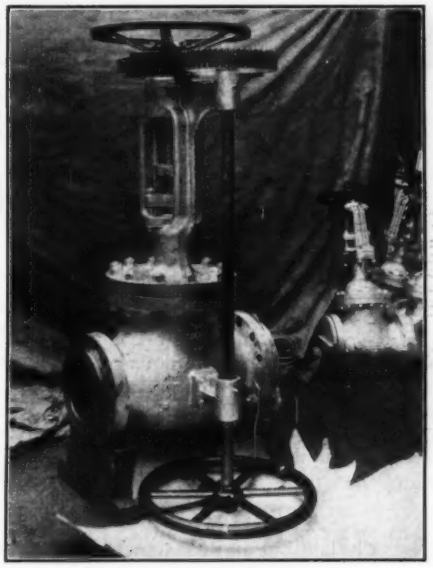
Condensers

Condensers under the turbines are of the surface type. The circulating water is provided by the mill supply pumps and is discharged into the mill treating system without the use of condenser circulating pumps. Feed pumps are turbine driven but other auxiliaries are generally motor driven. The older stoker is turbine driven, but the new unit has a constant speed motor with hydraulic variable speed drive.

The original turbine room planning was handled by W. L. Fergus & Co. as consulting engineers. The same engineers took care of the new turbine and boiler and are working on the economizer installations.

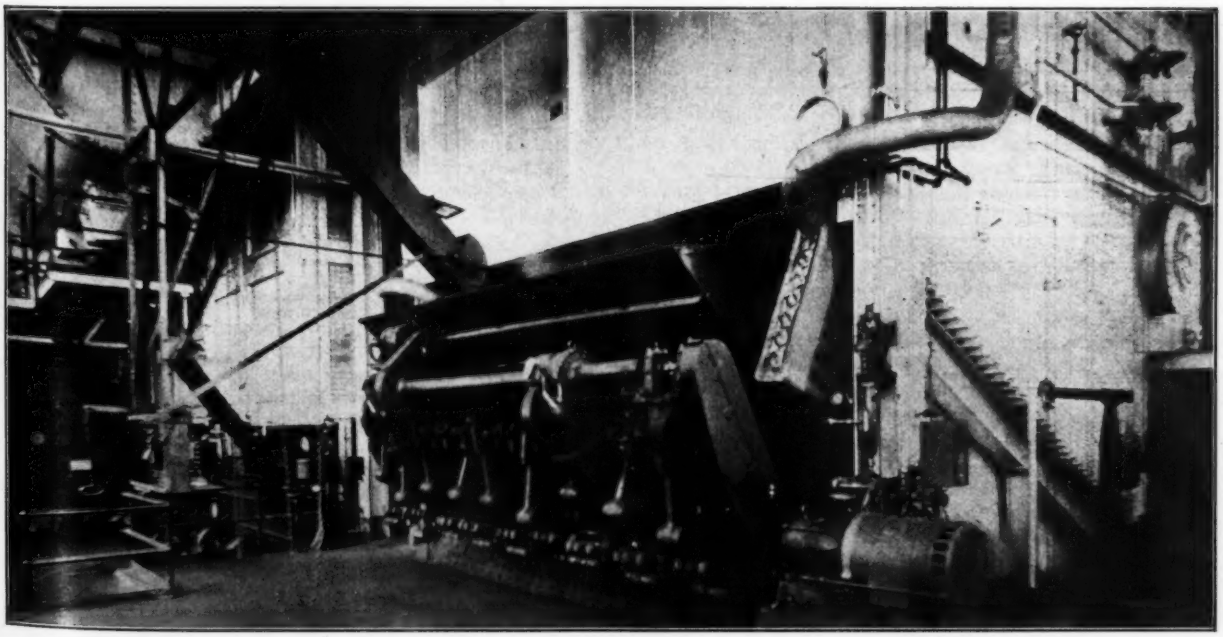
Boiler Stop Check Valves

An illustration is presented herewith of the boiler stop check valves furnished to the Fort Howard Paper Company by the Crane Company, of Chicago. They were built for 400 pound steam working pressure, fitted with exelloy to nitralloy seating surfaces and equipped with ball bearing yoke sleeve and furnished with Sarlun and flanges. There were installed in the main steam boiler leads between the boiler and the header.



CRANE BOILER STOP CHECK VALVE

The gearing is a special application, that is, this valve was so designed that it could be operated from above which is the normal position or it could be operated from the floor below due to the inverted extended handwheel. This design was worked out in collaboration with W. L. Fergus & Co., consulting engineers, and the valves, together with the piping, were installed by W. A. Pope Company, of Chicago.



SHOWING FRONT OF THE BOILER AND STOKER IN BOILER HOUSE EXTENSION

Belt Conveyors Prove Efficient Means of Handling "Black Ash" in Pacific Coast Pulp Mill Recovery Room

By D. L. Shirley[1]

The St. Helens Pulp and Paper Company, at St. Helens, Ore., has been operating continuously and efficiently since starting up in 1926, and has been very progressive and alert in finding ways and means to improve its operation. In April, 1935, it put into operation a system of steel belt conveyors in its recovery room, for handling Black Ash, which has proven highly satisfactory and efficient.

As Originally Laid Out

As originally laid out and constructed, its recovery room was so arranged that the three rotary incinerators each discharged black ash at the side of their furnaces, which were hand-fired, with the relative elevations such that the fire doors permitted charging of the furnaces to about fifty per cent of their depth as shown in sketch 1.

This left the upper portion of the refractory furnace linings exposed to the high temperatures developed in these furnaces, and involved a considerable expense in maintenance alone. At the same time, this required that each furnace handle the output of ash from its respective incinerator, and if a surplus or shortage developed at any one of the units, transfer of ash was difficult as well as expensive.

Approve Installation of Conveyor System

After careful consideration and check of the situation, engineering department and operating heads approved the installation of the conveyor system, every precaution being taken to insure constant operation, as the recovery must operate continuously. The accompanying elevation sketch illustrates the manner in which the 18 inch wide flat steel belts were arranged.

The ash discharges from the rotary incinerators and is piled up in a cone by an arm fixed to the end of the shell. This allows the accumulation of a small reserve storage, and the material runs through the opening in the floor to the conveyor, which runs at a slight incline under the floor, in front of each kiln, and conveys the ash to one end of the room. It is then delivered to the parallel conveyor, which is inclined to reach the necessary height and then extends horizontally over the center-line of the furnaces.

Ash Fed from Above

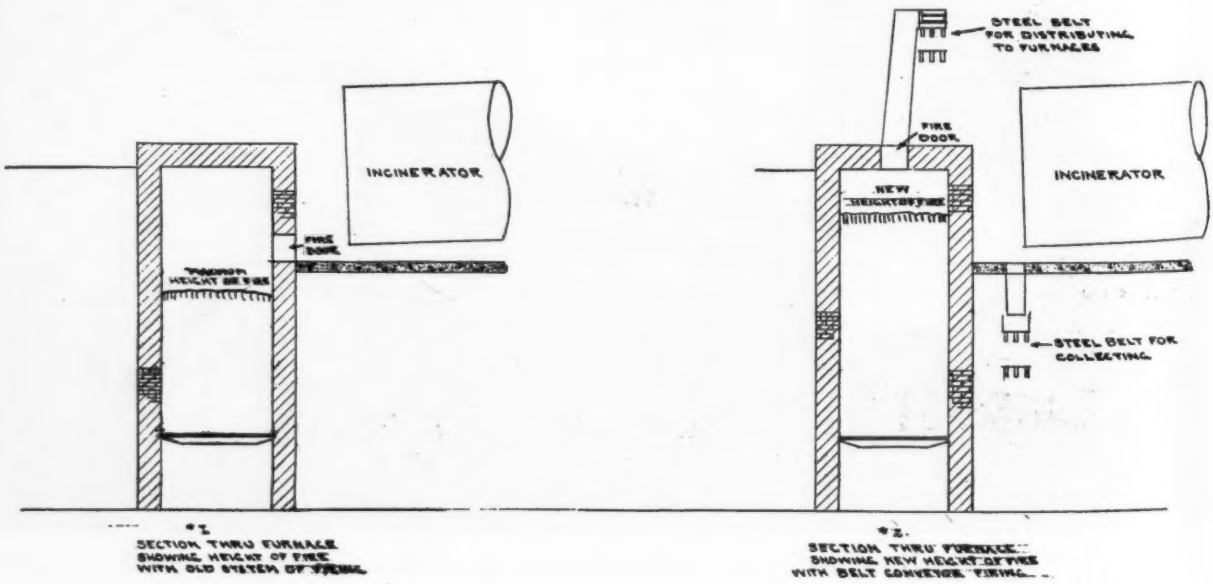
Ash is fed each furnace as desired, from above, by means of adjustable plows, providing an extremely flexible arrangement, and in addition, this has permitted sealing up of the side firing doors, and has removed the firing crew from the side to a much improved location above.

It has been found that more efficient distribution of the ash has produced a surplus available for operation of a waste heat boiler, and further economy has been obtained by carrying the furnaces about eighty per cent full, as shown in sketch 2, instead of fifty per cent. This greatly reduces the amount of exposed furnace lining, and alone is responsible for a material reduction in maintenance expense.

Steel Belts Selected

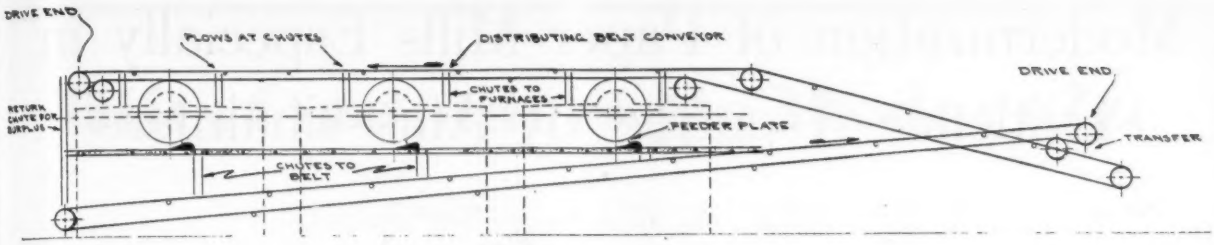
Steel belts were selected because the ash must at times

[1] Resident Manager, Link-Belt Co., Portland, Ore.



SECTION THRU FURNACE SHOWING HEIGHT OF FIRE WITH OLD SYSTEM OF FIRING

SECTION THRU FURNACE SHOWING NEW HEIGHT OF FIRE WITH BELT CONVEYOR FIRING



ELEVATION OF BLACK ASH BELT CONVEYORS

be handled at fairly high temperatures, and may often be rather sticky. Also operating with practically no sag between supporting idlers, it was possible to close in or house each run effectively, and discharge by plow can readily and cleanly be accomplished without likelihood of injury to the belt.

The Sandvik steel conveyor belts, carrying idlers, head and foot machinery, etc., were all furnished by Link-Belt Company, whose Portland engineering department assisted in working out details of design and construction of the complete installation, in cooperation with the St. Helens Pulp and Paper Company engineering department.

Oxford Paper Co. Alters Paper Machines

The Oxford Paper Company is continuing the process of modernizing its paper machines with the idea of product improvement and economy of machine operation. The equipment is in the process of manufacture and the proposed work on one of these machines is partially completed. According to the present program, eight machines will be completed early in 1936.

Program Part of More Extensive Plan

The program now in effect is part of a broader and more extensive plan which is intended to keep in step with the ever increasing demand for better papers produced at the minimum possible cost. Each machine is being carefully surveyed from the point of view of the requirements of the particular grade of paper being made and mechanical alterations are being incorporated to permit the greatest degree of control in the making of the required papers and at the same time producing these quality papers at the most economical speed and consumption of raw materials.

Wet End of the Machines

At the wet end of the machines, Fourdrinier alterations are being made including improvements to the head box design, Fourdrinier changes, table roll support, deckle devices, and slices.

On the Drier Sections

On the drier sections of the machines, additional driers and breaker rolls are being added and a general rearrangement is included for the control of the drier felts and drier drive which will permit drying paper at lower temperatures with the consequent improvement in quality of product. Drier steam control systems of the automatic temperature control type and improved condensate equipment is being installed. With these changes the greatest degree of flexibility is secured to meet the requirements of the wide variety of papers made in the Oxford mill.

The paper machine hoods are being insulated and are being equipped with low side curtains.

On the dry end of the machine, alterations are being made to the reel drives, the winder drives, and calender air system to improve control.

Other equipment being added includes new cantilever suction couch rolls, cross wire oscillating equipment, complete roller bearings for all table, wire and breast rolls and hypoid drives including magnetic clutches for the couch rolls. Drier felt control equipment of the most modern type is being installed which is intended to allow drying operation to be carried on under the most favorable conditions so far as paper quality and economy is concerned.

Improvements in Housing

The conditions of the rooms housing the various machines are also being improved by painting and lighting changes which will insure improved machine operation with resultant improved product.

Handbook of Industrial Tires

Of interest to practically every operating executive in all industries, a 24 page "Handbook of Industrial Tires" has just been published by the B. F. Goodrich Company, Akron, Ohio, and is now available upon request to the manufacturer.

First pages are devoted to reviews of exhaustive tests which show that rubber tires leave floors unharmed, while steel wheels on industrial equipment cause constant maintenance costs; less power is required with rubber tires to start loads and keep them moving; rubber tires even out the bumps and thus save power consumption or human energy as well as speed up operations.

Other pages give hints on how to select the right tire for the particular type job; how to handle changeovers from steel wheels to rubber tired equipment, and discuss the four types of rubber compounds which meet the tire demands of industrial users in many and varied services.

Description of the new "Vulc-On" rubber tired industrial wheels, together with a size and specification table giving detailed data on the tire problem is also included, as are size and specification tables for many other types of industrial tires which the company manufactures.

Three pages are devoted to the Goodrich pneumatic wheelbarrow tire, the industrial pneumatic type and the Zero Pressure Pneumatic, which cannot go flat, and is applicable in a great many industrial operations, particularly in yard work.

Modernization of Paper Mills Especially in Evidence Reported by Allis-Chalmers

As far as the installation of the products of the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., during the past year is concerned, modernization of paper mills was especially in evidence. Considerable numbers of new motor driven pumps of various types were sold to paper mills in all parts of the country. The V-belt drive continued to meet favor in every department of the paper and pulp mill industry because of its short adjustable centers, its moderate tension, non-slip, non-vibration, shock absorbing and water proof qualities. Numerous Texrope beater drives were installed in various sections of the country. One paper mill in the East recently installed its sixth Texrope beater drive during the past two years.

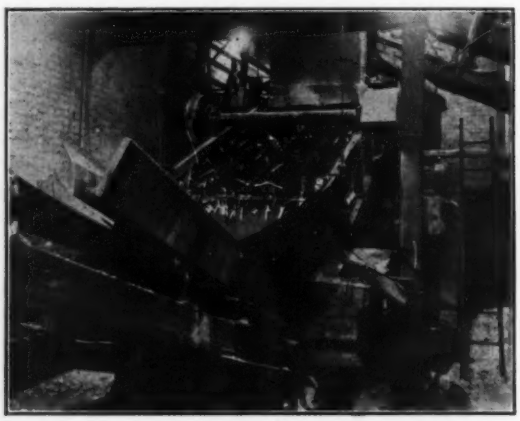
Two rather interesting examples of how paper mills have been modernizing are presented herewith. One illustrates the use of a more suitable type of screen recently installed. The other shows what can be accomplished in the way of modern power equipment.

Paper Mill Modernizes Power Plant

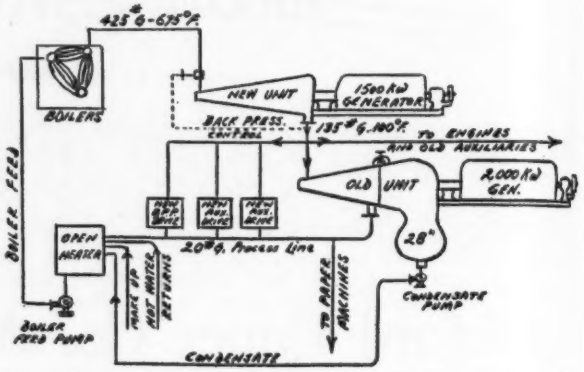
One typical outstanding example of modernizing old installations is the steam turbine driven alternator put into operation during the past year at the Watab Paper Company at Sartell, Minn. This installation consists of a 1,500 K.W. maximum 80 per cent P. F. 3-phase, 60-cycle, 4,800-volt high back pressure Allis-Chalmers turbo-generator unit.

As shown in the attached sketch the new 425-gauge pressure boilers and the new high back pressure 1,500 K.W. turbine generating unit were superimposed on the existing low-pressure plant. The new unit is fitted with a back pressure regulator designed so that a constant pressure of 135 lbs. gauge pressure may be maintained in the steam header.

Among the old equipment in this plant are a 2,000 K.W. Allis-Chalmers automatic extraction turbine driven alternator, an Allis-Chalmers Corliss generating unit, and various old auxiliary drives. The diagram also shows three small new impulse steam turbines as mechanical drives for auxiliaries. All these old generating units and the



ALLIS-CHALMERS AERO-VIBE SCREEN INSTALLED IN LARGE WISCONSIN PAPER MILL



STEAM DRIVEN TURBINE ALTERNATOR AT THE WATAB PAPER CO., SARTELL, MINN.

old and new auxiliary units take steam from the aforementioned 135 lbs. header. One of the new auxiliary turbines is direct connected to a boiler feed pump, the second and third being respectively direct connected to induced draft and forced draft fans. The exhaust steam from the auxiliaries goes to paper machines for process work.

Some of the advantages of such modernization are quite obvious. It amply illustrates how an existing low pressure power plant may be modernized to take care of the much better economy in high steam pressure and temperature. No money need be spent on existing equipment to obtain full advantage of the possible economy in the new steam conditions. Where the old low pressure boilers are still in good condition they can be made to supplement the exhaust steam of the new high back pressure unit, or can otherwise be used as standby.

More Modern Equipment Pays

Another evidence of modernization is illustrated in the attached photograph 106,639 showing a recent installation of an Allis-Chalmers Aero-Vibe Screen in a large Wisconsin paper mill. It is desirous to have wood chips of a uniform fiber length in producing high grade paper. The screen shown is a 5 x 10 feet double deck, thereby producing three products. The fines or undersize are rejected and used for boiler feed. The oversize are sent through on secondary breaker, while the remaining material on the lower deck is that wanted for high grade pulp. This screen is anti-friction bearing equipped and texrope driven. It replaced an older make of screen about three times its size. The outstanding characteristics of this screen are its saving in floor space and the decided reduction in power consumption.

Inquire Regarding Voluntary Agreements

WASHINGTON, D. C., October 30, 1935—It is reported that the tissue paper and waxed paper industries and the wholesale paper distributing trade have recently contacted the Federal Trade Commission in the matter of procedure in relation to the possibilities of trade practice conference rules or voluntary agreements—the latter including labor provisions.

Dilts Customers Do Modernize

During the past year we have built

Continuous Breaker Beaters for

Container Corp., Federal Paperboard, Consolidated Paper Co., Longview Fibre, John H. Heald Co. (Now building).

practically every continuous Breaker bought during the past year was built by Dilts.

Standard, New Type and Rebuilt Beaters for

St. Regis Paper Co., Norfolk; St. Regis Paper Co., Raymondville; Victoria Paper Mills, Sweet Bros. Paper Mfg. Co., Latex Fibre Industries, Pulp Products Co., W. A. Heinze, Fibre Board Products, Inc., Alton Boxboard & Paper Co., West Jersey Paper Mfg. Co., Glassine Paper Co., Fort Howard Paper Co., Harrisville Paper Co.

Hydrafiners and Refiners for

Gilman Paper Co., U. S. Gypsum Co., Fort Wayne Corrugated Paper Co., Gardner-Richardson Co., Schmidt & Ault Co., Container Corp., Brown Co., The Reiser Co., Racquette River Paper Co., Sweet Bros. Paper Mfg. Co.

Bandless Beater Rolls for

Flintkote Co., Ancram Paper Mills, Penn Fibre Co., Orenda Corp., U. S. Gypsum Co., Endicott Johnson Co., Victoria Paper Mills, Alton Boxboard Co., Consolidated Paper Co., American Can Co., Sweet Bros. Paper Mfg. Co., National Folding Box Co., Geo. O. Jenkins, Continental Paper Co.

Propeller Agitators and Modern Chests for

Container Corp., The Reiser Co., Pulp Products Co., Victoria Paper Mills, W. A. Heinze, Berst-Forster-Dixfield Co.

— Dilts —

MACHINE WORKS Inc. FULTON, N.Y.

"Your Paper Is Made in Your Beaters"

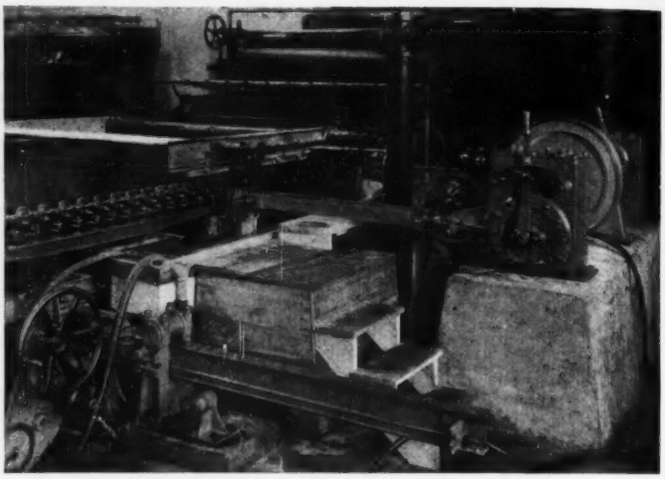
Rebuilt Fourdrinier Provides Removable Table Roll Section with Pitch and Shake Control while Running

The feature of having the table roll section of the Fourdrinier removable for wire changing has become established as an important factor in most machine modernization programs, and mention has already been made in *The Dominion Engineer*, published by the Dominion Engineering Company of one interesting installation which incorporated it with some success.

Now, for the first time in Canada a removable table roll section has been incorporated into the design of a shaking Fourdrinier which has been rebuilt to the order of the Rolland Paper Company Limited for their 102 inch machine at Mont Rolland, Quebec. From this mill come the popular brand bond papers bearing the "R" shield trade-mark which identifies the products of the Rolland Company.

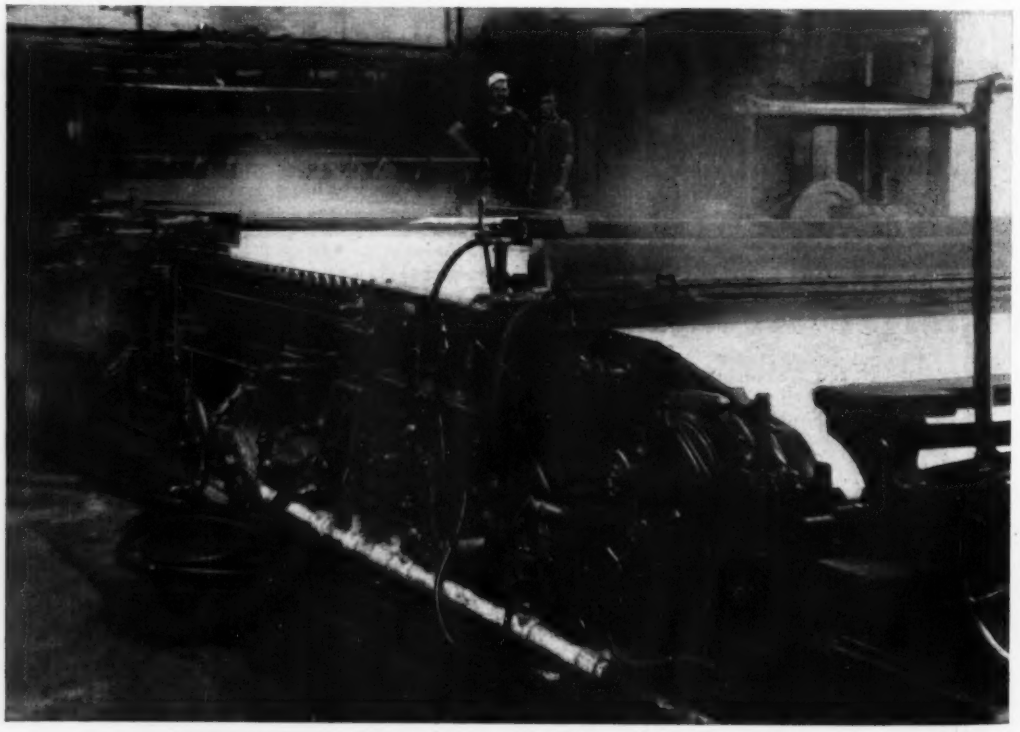
Structurally the unit presents an attractive appearance, and the controls for the many available adjustments are conveniently located. The main girders are set in brackets grouted to the foundation and carry such details as are not moved during wire changing—that is, outside wire rolls, wire stretcher posts and mechanism, jacking arrangement for varying the pitch of the wire, and the roll-out mechanism.

The suction boxes are not new, but they are supported in a new frame, and are not rolled out with the table roll section, but are handled separately with ease as before.



REAR OF FOURDRINIER, SHOWING SHAKE DRIVE AND CONNECTION AT RIGHT, WITH ROLL-OUT RAIL AND RAISING GEAR HANDWHEEL IN FOREGROUND

The framing of the removable section is of structural steel H-beams with welded reinforcement. This framing carries the rails upon which the removable section is rolled out when changing wires, the rails being then supported



REMOVABLE FOURDRINIER IN OPERATION ON 102-INCH BOND PAPER MACHINE

It's easy to see why KABLE KORD GRIPS!

A SIMPLE illustration, but it holds the secret of Kable Kord's sure grip on flat pulleys . . . *pressure!*

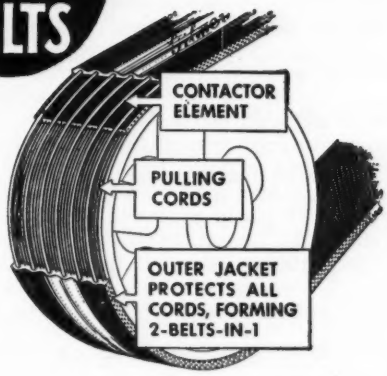
Kable Kord is "two-belts-in-one." Its lower part, comprising pulling cords, carries the load. The upper Kable Kords exert continuous pressure upon the pulling cords and thus squeeze them snugly against the pulley. Thus, Kable Kord transmits maximum power under every load condition. On flat pulleys for group drives, short centers and pivoted motor bases, it has *more pull per square-inch than any other flat belt made.*

Kable Kord's grip, however, is only part of the Kable Kord picture. Today, send for the Kable Kord Data Book. No charge. No obligation.

L. H. GILMER COMPANY
Tacony Philadelphia

Just slide your finger . . . slowly and lightly . . . across a smooth surface. SUDDENLY — exert pressure. Your finger STOPS.

Gilmer BELTS



KABLE KORD HAS NINE IMPORTANT ADVANTAGES

1. Made endless and in rolls
2. Increases production
3. Reduces slipping
4. Has minimum stretch
5. Is more flexible
6. Has inherent ruggedness
7. Has more pull per square-inch
8. Wears longer
9. Requires no belt dressing

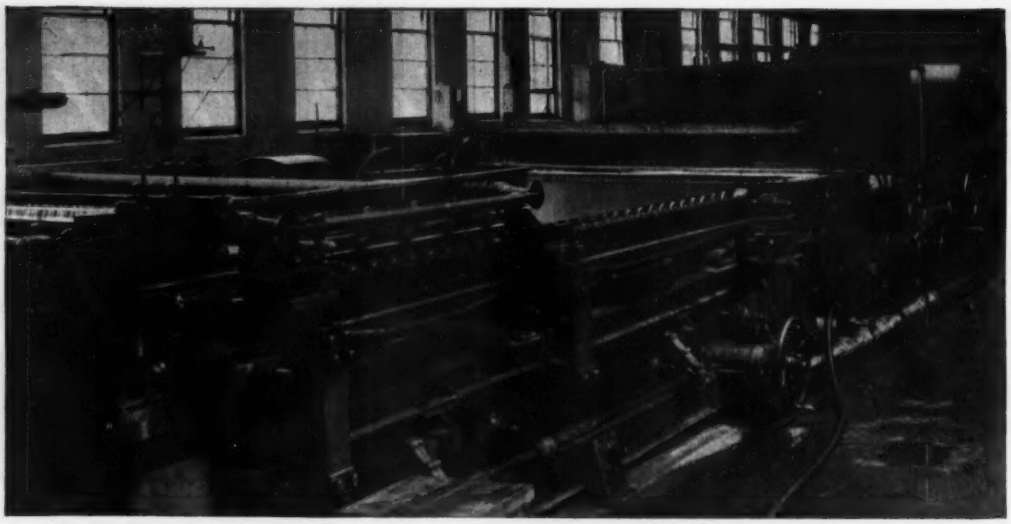
GILMER V-BELTS

Gilmer V-Belts provide the utmost in efficient and economical power transmission. Rugged, flexible, slipless and cool-running, they increase operating efficiency and decrease overhead costs. Sold in standard stock and special sizes to fit any make or size of drive.

Manufacturers OF COMPLETE LINE OF POWER BELTING

V-belts · Kable Kord Roll and Endless Flat Belting · Planer Belts · Speedage Endless Fabric Belts · Cone Belts · Roving Frame Belts · Moulded Rubber Belts · Winder Belts · Spinner Belts · Refrigerator and Washing Machine Belts · Conveyor Belts · Round Roll and Endless Fabric Belting · Endless Belting · Endless Cotton Belts · Laundry Feed Ribbons

SPECIALISTS IN QUALITY BELTS SINCE 1903



VIEW OF 102-INCH FOURDRINIER FROM WET END

upon rollers mounted on pedestals suitably located outside the framing. Simple arrangements are provided to allow the inside wire rolls to be attached to this framing before rolling out. The breast roll is placed over the couch roll, the loop of the new wire being then carried back by the crane and used to support the upper strand of the wire while the table roll section is being inserted. When the machine is in operation quick-acting clamps secure this framing rigidly to the machine frame to withstand the shake applied to the wire.

The table rolls are steel tubes, rubber covered to a diameter of 4 inches, and mounted in bronze lined bearings. These bearings are slotted to fit a dovetail on the table roll rail, so that the spacing may be altered at will. The bronze breast roll is mounted in anti-friction bearings, as are the wire rolls. The table roll rails and the laminated springs which support the shaking section, are of stainless steel, a material which is finding increasing favor for purposes such as these.

The shake mechanism consists of a pair of Dominion shake drive stands, with a common drive shaft, and therefore both driven at the same speed. The speed of the drive shaft may be varied within wide limits. The amplitude of the shake, however, may be adjusted independently on each, from zero to 5/8 inch without in any way interfering with the running of the machine or the flow of the stock, and as these drives are connected at different points along the wire, very accurate control of the formation on the wire may be maintained. The connecting links between shake drive and rail are also of stainless steel.

In the manufacture of a wide variety of papers such as is demanded of this machine, differing in finish, in weight, and in formation, the above feature is of great importance, as is also that which is provided by the raising mechanism by which the pitch of the wire may be varied anywhere from 3 inches downwards to 3 inches upwards. This is done, as described in a previous instance, while the machine is running, by raising or lowering the end of the forming table next the suction boxes, the adjacent end of the suction boxing being raised or lowered at the same time. This is done by hand-wheels at both the front and the rear of the machine, and does not interfere with the breast roll, so that no adjustment is necessary to the apron board or slice. A large diameter table roll is provided at the point of operation to avoid creasing of the wire.

The couch roll is a Dominion Suction Roll, of the Millspaugh type, and was built some time before the present rebuilding was projected. When changing wires, it is handled in the usual fashion, with a lifting bar.

New Photo-Electric Reflection Meter

The new Photo-Electric Reflection Meter which is just being placed on the market and which is of particular interest to the paper and pulp industry is designed for the objective determination of whiteness. The instrument consists of a newly designed self-generating photo-electric cell, a micro-ammeter, small Edison storage battery, volt-meter and two rheostats, one to control the potential of the light source and the other to vary the resistance of the micro-ammeter.

The entire apparatus is contained in a small hardwood case which is light and easily portable and the photo-electric cell may be applied directly to the surface to be measured as it is a separate unit with an extension cord which enables it to be used some distance from the rest of the instrument.

Incorporated in the instrument is a rectifier which makes it possible to charge the storage battery with A.C. There are also white and black plates and dishes with covers for powder measurements.

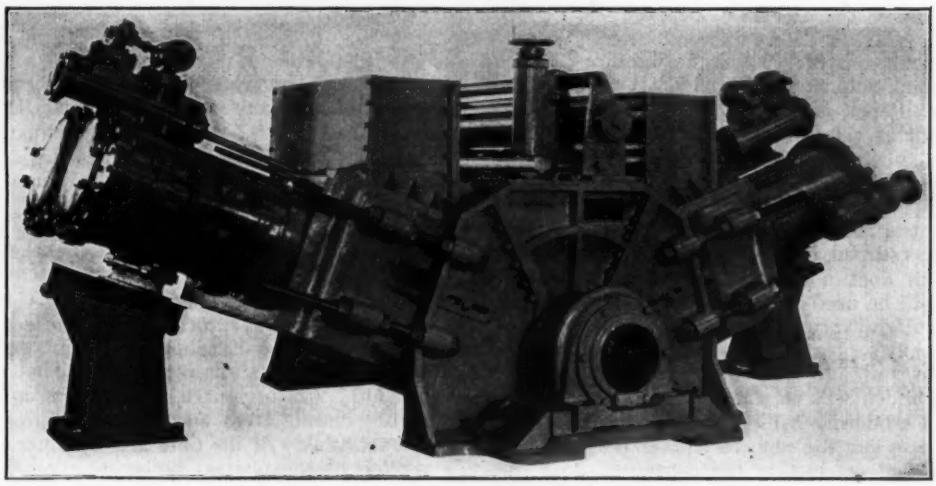
The unique feature of this instrument is the design of the photo-cell (which is contained in a highly polished nickel case). This cell has a central opening through which the rays from the light source are directed to the surface to be measured.

This is a very important advantage as the light source is always in fixed relation to the sensitive surface of the photo-cell and the specimen to be measured. By using a storage battery with a voltage control the potential of the lamp may be accurately controlled, thus eliminating the variations of current due to line surges and other causes which are present in most other instruments of this type.

The Micro-Ammeter is calibrated in light units and gives direct readings of reflection values in percentage, and illuminating strength in light units. By using the white and black plates alternatively opacity may also be accurately determined. Colored filters are also available for the measurement of various spectral ranges. Additional information regarding this new instrument may be obtained from Pfaltz & Bauer, 300 Pearl Street, New York.

The Great Northern Grinder

U. S. Patent No. 1757031



The Great Northern Grinder will enable you to reduce your operating costs and yet maintain maximum production of high-quality pulp. This grinder is simple and sturdy in construction, low in first cost, economical to maintain, and occupies less space than any other type of modern grinder.

With its many outstanding advantages, this grinder is the most important development in years in the art of making groundwood pulp. Seven years of experimentation and research, followed by three years of successful operation preceded the offering of this four-foot wood grinder to the industry.

Pre-measured charges of wood, delivered automatically to the pockets, and ground under pressure applied close to the face of the stone, eliminate binding and the grinding of wood on end.

The wide pockets, utilizing a maximum of the grinding surface of the stone, and the positive hydraulic pressure under which the grinder operates, make possible most accurate control of the grinding process, and allow production of 20 tons per stone and upward, of highest quality pulp.

The operation of the Great Northern Grinder is entirely from one floor, reducing labor and operating hazards to a minimum and eliminating the necessity for expensive wood elevating equipment. In addition, it allows this grinder to be installed in many existing grinder rooms with but minor building changes.

The wood is brought to the grinder by a water conveyor—the simplest form of conveyor to install, and the most inexpensive to operate. Furthermore, the water conveyor cleans the wood, keeping the grinder free from pieces of bark and sawdust which adhere to the wood when mechanical conveyors are used.

We should welcome the opportunity of making, without obligation on your part, a study of the adaptability of the Great Northern Grinder to your groundwood room.

MONTAGUE MACHINE COMPANY

Turners Falls, Mass.

To Start Work Early Next Year on New Zealand Sulphate Pulp and Kraft Paper Mill

Although actual construction on the buildings for the new ground wood, sulphate pulp and kraft paper mill of the Whakatane Paper Mills, Ltd., of Whakatane, New Zealand, has not as yet started, active work has been in process at the site in preparation for the building program, according to L. A. De Guere, paper mill engineer of Wisconsin Rapids, Wis., who drew the plans for the mill. Improvements to an existing wharf have been made and a five mile railroad is being built from the Government line which does not at present enter Whakatane. This railroad will be used for general transportation purposes for the mill, but principally for the delivery of logs from the company's plantation as well as timber which will come in by rail. In addition to the pulp mill and the paper mill which will be established by the company at this point, a modernly equipped converting plant will also be installed so that the concern will be in a position to deliver the finished product to the consumer. The company will make bags of various kinds, corrugated and solid fiber boxes, cartons and tissue specialties.

Hope to Start Mill By End of 1936

H. A. Horrocks, managing director of the company, will arrive in the United States on January 1 next for the purpose of completing negotiations for all the equipment to be installed in the plant. Mr. Horrocks will also go to England and Europe to confer with manufacturers of paper mill equipment. It is hoped to get the mill into operation by the end of 1936 or as early after that date as possible.

It is quite likely that a number of competent men for the various departments of the plant will be sent from the United States to start the mill if not to remain there. A number of men have already been contacted for this purpose and a selection will be made after Mr. Horrocks' arrival here.

L. A. De Guere Makes Preliminary Study

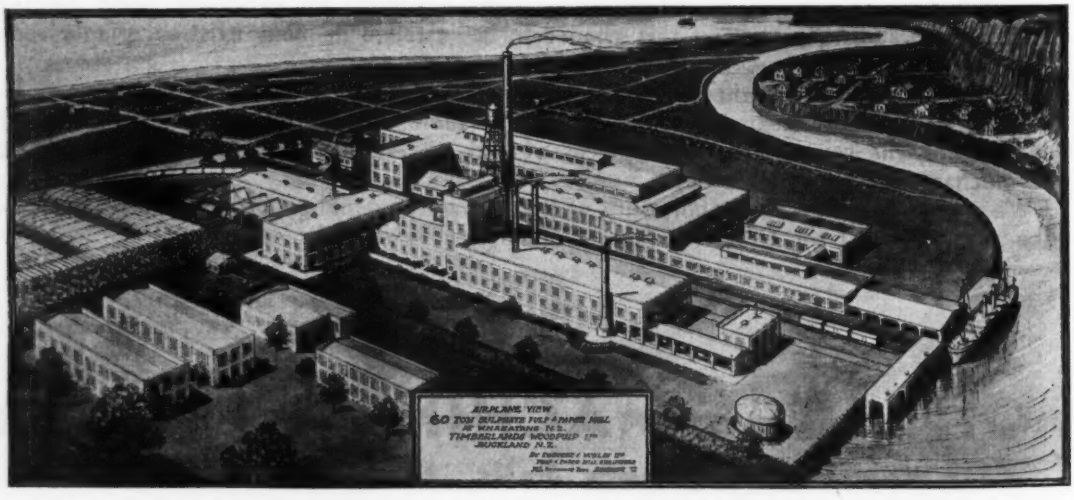
The Whakatane Paper Mills, Ltd., was originally known as the Timberlands Wood Pulp, Ltd., a forest growing organization. The name was changed more accurately to describe the company's new operations. L. A. De Guere was engaged in 1932 to make a preliminary study of the possibilities of building a pulp and paper mill in New Zealand. Mr. De Guere left early in January of that year and devoted six weeks in New Zealand to a thorough analysis of the practical phases of making pulp and paper from the native forests and from the planted forests of Timberlands Wood Pulp, Ltd.

The planted timber which Mr. De Guere studied is "insignis pine," a tree originally imported from California. In New Zealand's climate this pine grew much more rapidly than in its native state. Timberlands Wood Pulp, Ltd., was organized many years ago for the purpose of planting trees and then harvesting them upon a perpetual basis. At the time Mr. De Guere was employed a portion of the planted timber was nearing commercial size, being seven years old. Mr. De Guere reported that the trees grow to a usable size in from ten to twelve years, although the company does not expect to utilize trees at this age.

The company has in addition to its own plantations a large tract of native timber suitable for pulp and paper manufacture. In the early years of operation the mill can also draw upon thinnings from government plantations of insignis pine.

Tests Made at Forest Products Laboratory

Mr. De Guere returned to this country late in March, 1932. Tests were conducted by the United States Forest Products Labratory at Madison, Wis., and the pine was found suitable for pulp, particularly sulphate pulp. Plans were begun by Mr. De Guere in conjunction with R. P. Worley, with whom he formed a partnership in the engineering firm of De Guere & Worley, 404 New Zealand Insurance Buildings, Auckland, New Zealand. Continuous study and planning have been carried on by Mr. Worley in New Zealand and by Mr. De Guere in



PERSPECTIVE VIEW OF PROPOSED KRAFT MILL OF WHAKATANE PAPER MILLS, LTD., NEW ZEALAND

TENSILASTIC *is NOT* an ordinary rubber roll containing an anti-oxidant

TENSILASTIC rubber rolls have been making such sensational performance records, superintendents are asking embarrassing questions regarding other rolls. And, quite often, the competitor's answer is "Our rolls are just as good as TENSILASTICS. Tensilastic is just an ordinary rubber roll containing an anti-oxidant." Which isn't the correct answer.

TENSILASTIC does contain an anti-oxidant, but, that's not the reason for its superiority. It is vastly more than an anti-oxidant.

TENSILASTIC has the ability to rebound quickly—to snap back into shape after pressure. It has a live elasticity that overcomes distortion and corrugation, and assures better, longer performance.

In a Modulus test, TENSILASTIC just walks away from other rubber rolls. What is Modulus? Modulus is the measure of elastic rebound. It is not enough to have high tensile or correct density, your roll must have correct Modulus for long efficient service. That is one reason for TENSILASTIC'S wonderful performance.

But that's not the only reason. TENSILASTIC possesses qualities found in no other rubber rolls. In addition to its elasticity, it is amazingly resistant to wear and abuse, to oxidation and deterioration. Its tensile strength and uniformity of density are maintained long after ordinary rolls are ready for the discard.

TENSILASTIC is a super roll. It didn't just happen. It's the result of nearly fifty years of rubber roll manufacture, of careful research by specialists in our laboratory working in close cooperation with leading paper and paper machinery manufacturers.

Try TENSILASTICS—press, table, breast, couch, wire or carrier roll—in your toughest positions, and keep an accurate performance record of these Super rolls. Then you'll realize why we say TENSILASTICS are not ordinary rubber rolls containing an anti-oxidant.

American Wringer Company, Inc.

Rubber Roll Specialists for nearly 50 Years

WOONSOCKET, R. I. FARNHAM, QUEBEC

33 No. La Salle St., Chicago 267 Fifth Ave., New York

Pacific Coast Representative: Walter S. Hodges, Terminal Sales Bldg., Portland, Ore.

TENSILASTIC

RUBBER ROLLS

this country, which have now resulted in the completion of plans for a kraft pulp and paper mill.

The plant of the Whakatane Paper Mills, Ltd., will be located about 200 miles southeast of Auckland, New Zealand, on the Whakatane River a short distance from its mouth and adjoining Whakatane, a town of about 2,000 people. This river empties into the Bay of Plenty and the location will be accessible for in and out shipments by both rail and water. The company timber plantations are located within twenty miles of the mill site and it will have its own railroad for transporting logs from the logging district to the mill. The timber from this district after having been put through a series of pulping tests by the Forest Products Laboratory at Madison was found to be admirably suited to the manufacture of all grades of kraft paper and has been pulped satisfactorily by all the commercial processes.

Ground Wood, Sulphate Pulp and Paper Units

The initial installation will be a sulphate pulp mill of sixty tons daily capacity, a ground wood plant of twenty tons, and a paper mill to utilize the product of the pulp mills. The plant will be self-contained throughout as it will manufacture its own power, own its timber, railroad, and probably eventually its own steamers for carrying the finished product to the centers of importance in New Zealand and Australia. The plant will manufacture boards, machine-glazed and machine-finished paper.

To Be Equipped With Most Modern Machinery

It will be equipped with the most modern up to date machinery in all departments and will have a number of features not heretofore incorporated in plants of this type. It will be substantially built of reinforced concrete and steel construction and so laid out that future expansion can take place without in any way interfering with operation or any alteration in the original installation.

The site includes more than enough land to permit future expansion to 300 tons per day and provide ample storage for pulpwood supplies. Since the timber plantations are only a few miles away and operations can be carried on in the woods all year round, there is no necessity for carrying a large supply of pulpwood on hand at the mill. From its own extensive plantations, the company will be assured of a perpetual supply of pulp timber close at hand and a low cost delivered to the mill.

The engineering work of the new mill will be in charge of De Guere & Worley, Ltd., of Auckland, New Zealand. This firm consists of L. A. De Guere, pulp and paper mill engineer of Wisconsin Rapids, Wis., and R. P. Worley, C. E., of Auckland, New Zealand.

Sutherland Profits Up $51,012 for Quarter

The Sutherland Paper Company, Kalamazoo, Mich., reports for quarter ended September 30, 1935, net profit of $182,281 after charges and federal taxes, equivalent to 64 cents a share (par $10) on 287,000 shares of capital stock, comparing with $131,269 or 45 cents a share in September quarter of previous year.

For nine months ended September 30, last net profit was $472,441 after charges and federal taxes, equal to $1.65 a share, against $334,067 or $1.16 a share in first nine months of 1934.

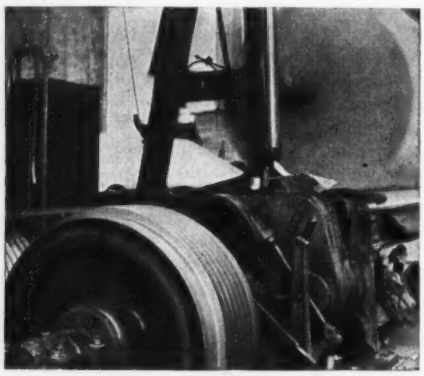
Current assets as of September 30, 1935, including $611,521 cash and government bonds, amounted to $1,866,281 and current liabilities were $334,525. This compares with current assets of $1,644,210 and current liabilities of $317,735 on December 31, 1934.

Horton Variable Speed Pulley

The Horton Manufacturing Company, Minneapolis, Minn., claim that in their comparatively recent development of the Horton Variable Speed Pulley, for application to a variety of services in paper manufacturing and fabricating plants, they have made available, to those industries, facilities which meet the need for improvements in drives for winders, all sizes and types, for shockless starting, gradual acceleration, uniform tension and variable speed.

As stated by the manufacturer, the Horton Pulley is a governor-controlled, spring tension, easy starting, gradual accelerating variable speed mechanism, capable of shocklessly breaking the initial starting inertia and driving the driven machine to full speed, gradually and without irregularities.

In winder service its speed range is from zero to belted speed and where the torque load is constant, speed



HORTON PULLEY AND A 50 H.P. CONSTANT SPEED MOTOR DRIVING CAMERON 18 REWINDER

changes can be effected a few revolutions at a time and continuously held at any set between belted speed and a 50 per cent reduction therefrom.

Introduced a few years ago in the tissue converting departments of paper mills around Green Bay, Wis., the manufacturer reports that in order to meet the very insistent demand springing naturally from services exceptionally well performed in those mills, the original apparatus has been re-designed, improved and specially adapted to a variety of industrial uses.

As a tension control and drive for winding or rewinding flimsy tissue or heavy board, the manufacturers claim that the Horton pulley is without an equal,—that it reduces broke to a minimum, assures hard centers and uniform rolls insofar as uniformity is affected by the winder drive. Driven from constant speed motors, full torque is available throughout the winding process.

When operating at full speed, power consumption is not affected but there is an important reduction in the amount of power consumed through the Horton Pulley when bringing the driven machine from rest to full speed. This element becomes important under conditions of high starting frequencies.

Horse power, although an essential, is only one of the elements which must be taken into consideration when selecting a Horton pulley for a given service, therefore Horton pulleys are not sold on a strictly horse power basis. A proper selection involves various factors in addition to horse power, such as speed, starting frequencies, torque load, character of service, etc. It is now offered in sizes from fractional to 100 horse power.

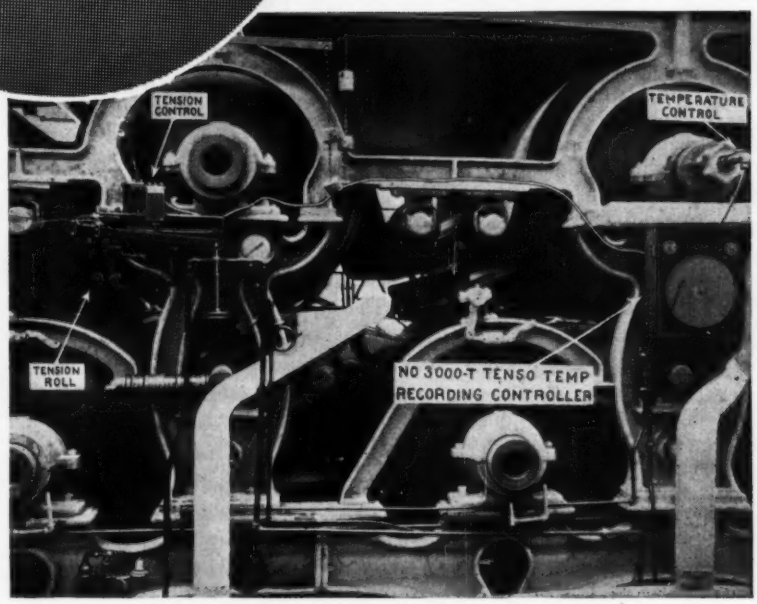
For Better Paper Drying Use Tenso-Temp Control

MASON-NEILAN Tenso-Temp control combines all the advantages of *tension* control—all the advantages of *temperature* control.

Under *any* conditions, regular or irregular, you get positive control over the moisture content of your paper.

If there is a change in the basic weight of your sheet, or in atmospheric conditions, in stock density or freeness, or in the heat content of supply steam, the Tenso-Temp detects it and automatically resets the dryer temperature several minutes before the operator could see or feel a change in sheet condition.

Full or semi-automatic break control may be incorporated in the system.



Tenso-Temp control operates like a standard temperature control system, with its bulb inside a dryer roll and its control valve in the dryer steam header—until a change in moisture content alters the tension of the sheet. Then the tension control unit takes charge and *resets* the control temperature automatically. After the reset, the control is transferred to the temperature unit and over-control is anticipated.

The new Tenso-Temp control will repay you, not only in more uniform paper, but in more economical operation of your boiler plant. You can install it economically. Write for bulletins and full particulars.

MASON-NEILAN REGULATOR CO., • 1190 ADAMS STREET • BOSTON, MASSACHUSETTS

MASON-NEILAN

PRESSURE • TEMPERATURE • FLOW CONTROL

Flambeau Paper Co. Installs Filter Plant

By L. G. Simons[1]

Water supplies have always been closely associated with the daily operations of paper mills—sometimes because of the use of water for power or steam generation or through the use of water as a vehicle agent to carry the fibers in process. The Flambeau Paper Company mill is located adjacent to the Flambeau River and is dependent upon the river for all three of the above functions, that is to say, power generation by means of water turbines, steam generation in the boilers and water for process usage.

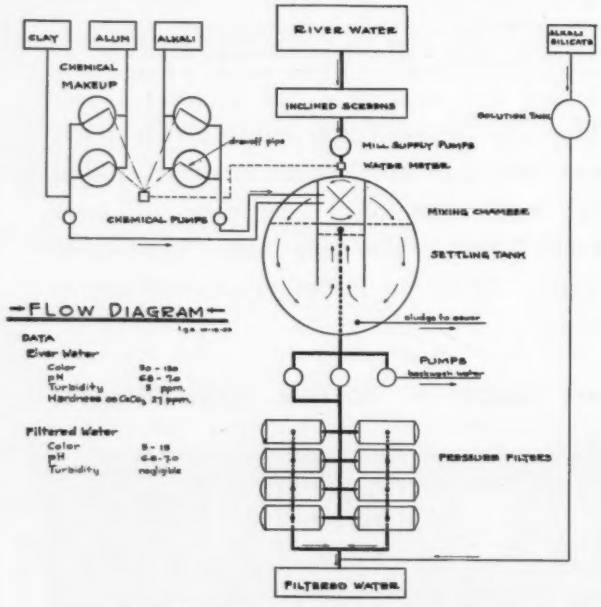
With the development of higher grades of paper came the necessity of providing clear, colorless water for process use. This will be realized shortly after November 1 with the installation of a water treatment and filtration plant now under construction. The plant will have a capacity of 5,000,000 gallons of water per day which is sufficient to supply filtered water to all processes requiring fresh water dilution. In other words, the fibers will be in contact with treated water at all stages of the manufacturing process.

Permutit Co. Supplies Entire Equipment

This improvement will result in a marked betterment of color and brightness and will reduce materially the amount of dirt specs in the finished product. The Permutit Company of New York, well known in the water purification field, is supplying the entire equipment.

The larger equipment includes eight Permutit Pressure Filters each eight feet in diameter by 25 feet long, four chemical solution tanks and one large combination mixing and settling tank 49 feet in diameter by 20 feet high. Two high pressure pumps of Allis Chalmers manufacture will supply the mill with a total of 3,500 gallons per minute of filtered water and one pump of 2,000 gallons per minute capacity will be used to backwash the filters as occasion demands. Two small chemical pumps will transfer alum and alkali solutions to the mixing chamber.

[1] Plant Engineer, Flambeau Paper Co.



FLOW DIAGRAM OF FILTERING SYSTEM

Seasonal Variation in Coloration

The Flambeau River is controlled in the amount of flow by a dam and reservoir located twenty miles upstream from the mill. The presence of rotting timber in the reservoir contributes a large percentage of the brown coloring matter found in the water. Several analyses taken at different times throughout the year have shown that there is a seasonal variation in the amount of coloration. In the winter time the color is not particularly detrimental to the process of paper manufacture but with the beginning of the spring rains the color number increases to a maximum of about 130 on the color scale. Despite the re-use of white water, it is impossible to keep the color of the water from darkening the sheet and it is especially noticeable in lapped groundwood and sulphite pulp.

The problem of water treatment then resolves itself into one of removing organic coloring matter which causes the brown coloration. After considerable laboratory work on the part of the company and the Permutit laboratory, a method of water treatment was devised that would take care of the seasonal variations in the amount of color and produce a clear colorless water as desired.

General Method of Treatment

The Flow Diagram indicates the general method of accomplishing these results. River water is screened as it is admitted to the mill thereby removing bark and other coarse suspended matter. This intake is the general source of supply for the entire mill. Sufficient water for the filter plant is tapped off of the mill supply line and is conducted through wood lined pipe to the mixing tank where chemicals are added. Flocculation begins almost immediately and after proper agitation in the mixing chamber, the water flows through a settling chamber where the floc settles out.

Relatively clear water is drawn off near the top of the settling tank and pumped to the pressure filters where the remainder of the floc is filtered out. After passing through a bed of five sizes of sand and gravel, clean, colorless water is ready for mill use except for the fact that it is slightly acid. The addition of alum in the mixing tank causes the pH to drop to around 5.8 and so it is desirable to restore the pH to about neutral. This is accomplished with a caustic silicate feeder which apportions an alkaline solution to the water as it leaves the pressure filters. The addition of caustic silicate also leaves a coating on the inside of the pipe that is an aid to the prevention of corrosion.

Theory for the Addition of Clay

Beside the regular use of alum and alkali as coagulants, provision is made for the inclusion of clay at such times as the daily tests show that it is advantageous. The theory for the addition of clay to colored water is that the finely divided clay particles form nuclei for the precipitated alum floc and the coagulated coloring matter, so that the mass particles so formed will settle faster due to the increased weight. Tests in this respect have shown that the period of sedimentation may be reduced far below normal expectations with the addition of clay, although care must be exercised to avoid clay with too fine a particle size as

Concerns like the . . .

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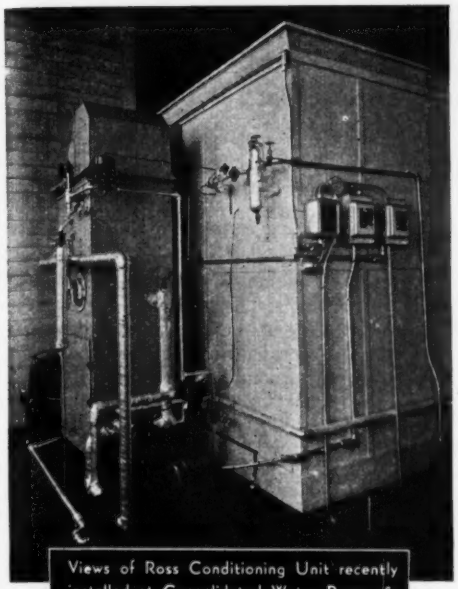
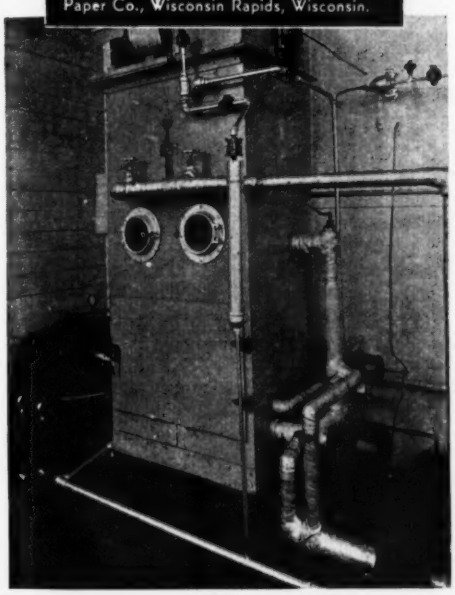


Views of Ross Conditioning Unit recently installed at Consolidated Water Power & Paper Co., Wisconsin Rapids, Wisconsin.



agree that

ROSS knows AIR CONDITIONING

A particular kind of experience is required to design equipment that will achieve definite standards of air conditioning performance. Complete control of both temperature and humidity—at all seasons—within any predetermined condition, is a positive requirement. To insure the maximum measure of efficiency and economy in equipment and operating costs, Consolidated Water Power & Paper Company, along with other leading manufacturers, has installed the reliable ROSS Air Conditioning Apparatus.

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the finer particles will not settle out and will put too much duty on the filtering units.

The Permutit system of chemical feed deserves some notation. A meter placed in the raw water line is so devised that with the passage of a definite amount of water through the pipe a corresponding volume of chemical solution is discharged to treat that amount of water. The chemical dosage is determined by the rate at which a draw-off pipe lowers in a solution of predetermined strength. If the daily analysis shows that the raw water requires four grains of alum per gallon, a single setting of the electro-chemical control feeder determines the rate at which a tank full of alum solution will be used. A similar attachment governs the quantity of alkali dosage and since the two feeds operate through the same control, the ratio of alum to alkali is maintained. Various applications of this system of dosage in chemical industry have shown its unusual reliability and accuracy.

Increased Light Values With White Paint

An outstanding example of the relation of paint to light is demonstrated in some recent studies made at the American Stove Company, in Lorain, Ohio.

A variety of structural and ceiling types corresponding to those commonly used for industrial buildings has been used in the American Stove plant. Before rehabilitating this building for a new production schedule, it was decided to plot the levels of illumination throughout the plant by means of a Sight-Meter, to determine what the levels were and what might be done to improve them with a view to bettering working conditions and operating efficiency.

The Sight-Meter is designed to measure in units of foot-candles, or the amount of light falling one foot in any direction from a candle flame. Measurements were taken at 6 foot intervals across the width of the building before and after repainting with white paint, and the readings were plotted to scale on cross section diagrams of the several buildings. The resulting light curves showed the improvement in the illumination where monitor and other ceiling types were sky-lighted with white paint to reflect all the available day and artificial light down over the working plane. These readings were taken on days of comparable light intensity out of doors, and the paint job was but one-coat over a very dirty surface. A second coat would have still further increased the light levels.

From the diagram it may be noted that the light on the working plane at 5:00 P. M., March 4, after painting is 100 per cent better than at 5:00 P. M. February 21, before painting. At 5:10 P. M. on March 12, the working light was 15 foot candles in the monitor bay when painted, as compared with 5 foot-candles prior to painting.

In the 40 foot bay, painting more than doubled the working light. There are no windows along this side of the building and the monitor sash is less than normal height. Nevertheless painting brought the light up to 4 foot-candles at 5:00 P. M. compared with 1½ foot-candles at 4:00 P. M. before painting.

To the plant operator a survey of this sort is significant in that it demonstrates how by utilizing the reflection values of paint a shop floor may be given a greater and more evenly distributed flood of day or artificial light, making it useful for exacting producton or other operations. According to studies on paint reflection values made by the Sherwin-Williams research laboratories white has a reflection value of from 84 to 89 per cent, cream 77 per cent, and buff 63 per cent, light green 52 per cent, gray 46 per cent, brown 16 per cent and black only 2 per cent. On ceilings and walls these reflection values may make the difference between a poorly lighted and a well lighted interior. Employees need all the light possible to perform their work efficiently and safely, and without the handicap of eye-strain and nervous fatigue. It has been estimated by the Better Vision Institute that approximately 85 per cent of our impressions are received through the eyes, and the energy consumed varies with the ease of visibility. Abundance of well diffused light on an object makes it easier to see and has the effect of magnifying it. Moving objects appear to be moving slower, thus increasing safety and accuracy. In the production line these are important considerations.

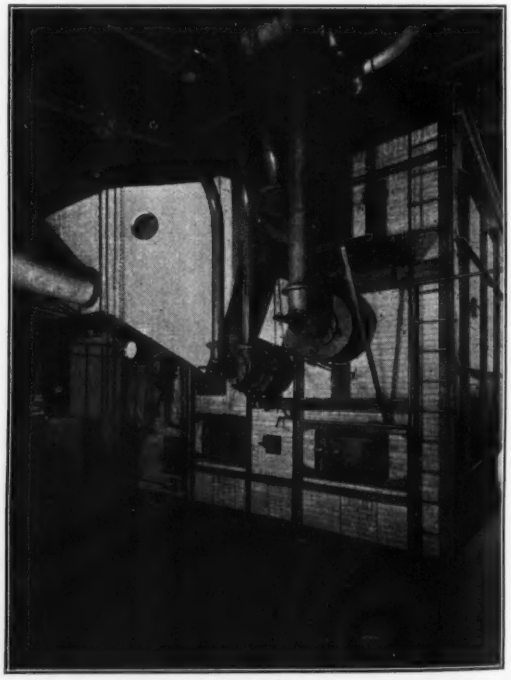
Byron Weston Steam Plant Improved

The Byron Weston Company, Dalton, Mass., offers an excellent example of boiler room modernization that makes similar conversions interesting possibilities to other mills faced with the necessity of reducing production costs.

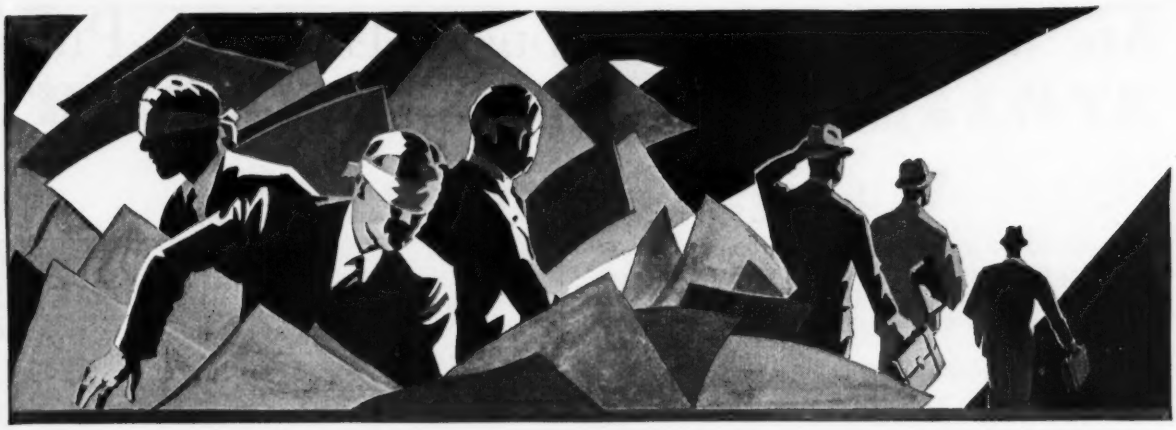
The old plant contained a number of hand-fired HRT boilers that generated the process steam used in the production of this company's paper, and were replaced without any changes being made in the existing building.

The new boiler unit is a pulverized-coal-fired B&W Integral-Furnace Boiler having a maximum capacity of 35,000 pounds of steam per hour at 440 pounds pressure at the superheater outlet. With this unit, the furnace is integral with the boiler and, with the exception of the front wall, is completely water cooled. The unit is being operated successfully by the old firing staff, the members of which have had experience only with hand-fired HRT boilers.

Data on operation are not available, but with the efficiency of the Integral-Furnace Boiler ranging from 82.3 to 84.6 per cent at outputs of 12,000 to 35,000 pounds of steam per hour, as compared with the well-known low efficiency of HRT boilers, the dollar savings are evident.



THIS UNIT, COMPLETE WITH SUPERHEATER, WATER-COOLED FURNACE, COAL PULVERIZERS, BURNERS AND CONTROL EQUIPMENT DELIVERS FROM 4000 TO 35,000 LBS. OF STEAM PER HOUR.



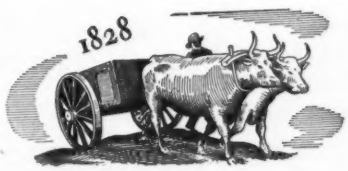
WE HELPED THEM TURN *from* SEARCHING *to* SELLING

(1) A manufacturer who had developed a new formula for a stock to be produced at less cost asked S & W to design and build a special wet machine which would overcome certain difficulties, allow his firm to meet the price requirements of a new market. The completed machine insured correct formation in the vats and a uniform sheet from the cheaper mix. It also cut the loss from drying oven wrinkles from 20% to less than 1%.

(2) Another manufacturer suffering great losses due to cutting uneven edges of paper asked S & W to develop a new calender feed. This device has reduced cutting losses from 25% to 1 or 2%, has enabled him to go after markets which before had considered his product too high-priced.

(3) A fine tissue and condenser paper manufacturer seeking to crack the quality market decided to make the finest possible sheet in widths of more than 100". No thickness variations, no pinholes, no waste from cockles would be allowed. Three special machines were designed and built by S & W—the widest Fourdriniers operating in the world today on finest tissue and condenser papers.

To you and your consulting engineer S & W *brings the country's longest experience in building machinery for high-grade papers. Send for* "CARRYING THE TORCH," *a brief history of American paper-making growth.*



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PLANT AND OFFICES AT SOUTH WINDHAM, CONNECTICUT

Arc Welding Builds Longer Life into Pulp and Paper Mill Equipment

By R. R. Kondal[1]

To prevent locked-up stresses which hasten corrosion of metal and, at the same time, to secure maximum freedom from porosity, the company with which the writer is connected has adopted arc welding in the construction of digesters for the Detroit Sulphite Pulp and Paper Company, Detroit, Mich., for making pulp. It has been found that the uniform tensile strength, resistance to corrosion and freedom from porosity of shielded arc weld metal gives very much better results in cost, design and operation factors than has been possible with other methods of construction.

The digester (Fig. 1) is a large pressure drum which cooks the cellulose in its combined form either as rags or as wood chips for making pulp in the first stages of paper manufacture. This cooking is done in the presence of strong acids or strong alkalies depending on which process is used. The cooking is done under controlled temperatures and pressures. These conditions themselves are highly conducive to corrosion and unless the shell of the digester is shielded from them, corrosive action takes place at a rapid rate, finally resulting in the eating away of the metal of the shell.

Digester Has Special Lining

In order to protect the shell of the digester from strong acids, the digester is lined with a special heavy material which is very costly. This lining sometimes cracks under expansion and contraction due to changing temperatures in the digester. Under the normal riveted construction if a hole or a leak occurred in the shell of the digester the strong liquor would not only leak out through the hole but spread between the lining and the shell, consequently attacking the steel shell. In order to combat this where a leak would occur it was usually necessary to drill a hole and introduce under pressure some neutralizing agent which would spread between the lining and the shell. Now, with the welded leakproof construction when a crack in the innerlining does occur the metal immediately in back of the crack will become attacked only for a short period of time until the cooking liquor is neutralized during the cooking process at which time a sludge is deposited and the crack is filled up with this neutral precipitate or sludge. In other words, it seals itself provided there is at no time a leak through the shell which the welded construction makes possible.

However, in order that this neutralizing agent may perform its function effectively, it is essential that the acids do not find a point at which they can work their way through the lining faster than they can be neutralized. For this reason, the shell must be as free from porosity and cracks as it is possible to make it.

Leak-Proof Construction

With the previous riveted construction, numerous points were always available for the acids to leak through, due partly to the locked up stresses left in riveted construction and partly to inability to obtain perfectly tight construction. Due to the ease with which corrosion attacks stressed metal, once a leak developed, corrosion and grooving would take place rapidly. With the present type

[1] The Wickes Boiler Co., Saginaw, Mich.

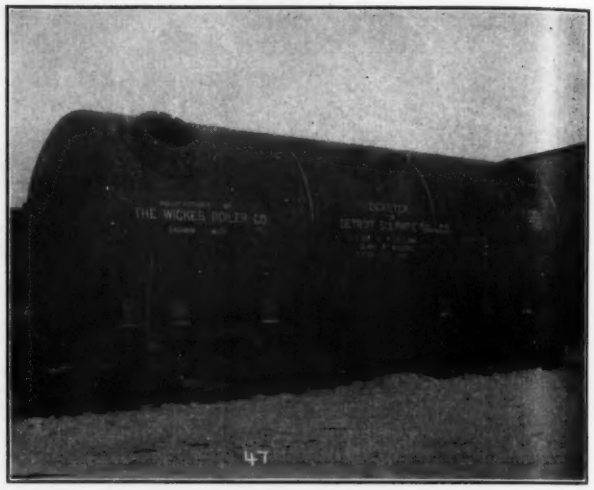


FIG. 1

Arc welded construction resists corrosion and thereby increases the life of this 76,000 pound digester built entirely by the shielded arc process by the Wickes Boiler Co., Saginaw, Mich.

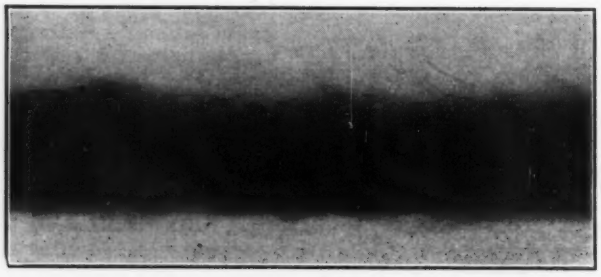


FIG. 2

X-ray film showing freedom from porosity of weld metal as obtained by the shielded arc process of welding in construction of digester. Compare with Fig. 3.

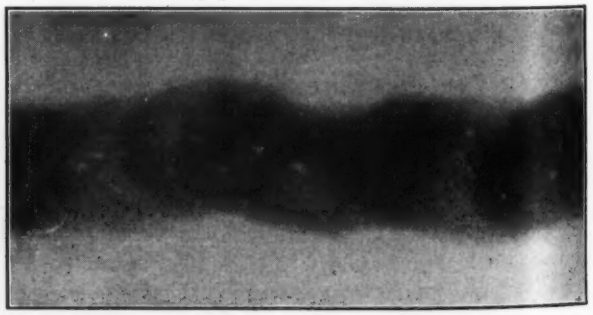
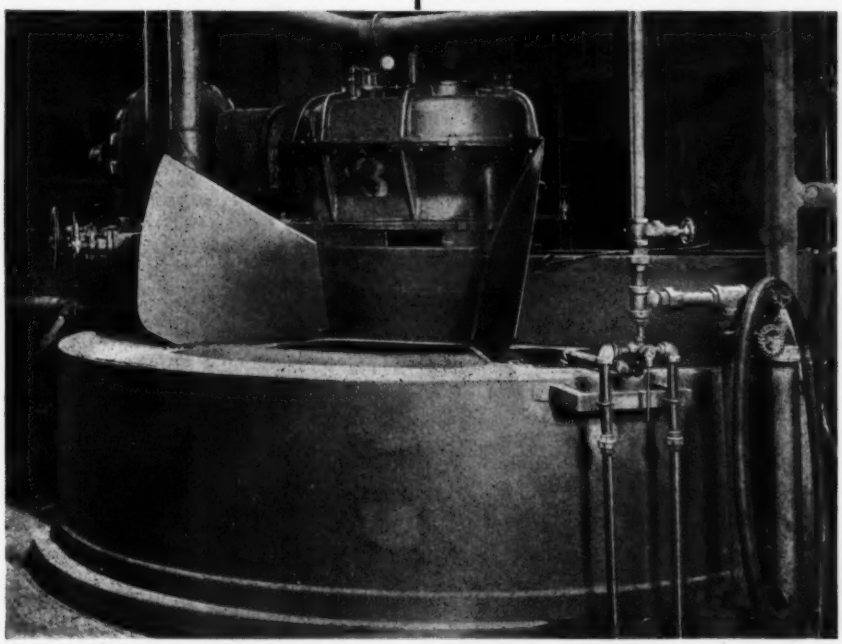


FIG. 3

X-ray film of a weld which would be passable in boiler work, but not acceptable from the standpoint of porosity in construction of a digester. Compare with Fig. 2.

THE SAVING IN POWER ALONE PAYS FOR ITSELF!



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From every angle, it is a beater of improved preformance.

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of construction using arc welding, it is possible to make leak proof joints and consequently hold the action of corrosion within very narrow limits.

Thoroughly Leak Proof

Just how thoroughly leak proof these joints are can be appreciated from Fig. 2 which is an X-ray film showing the denseness and freedom from porosity of the weld metal produced. Realizing the extreme importance of non-porous construction, the company exceeded the requirements of the A.S.M.E. Boiler and Unfired Pressure Vessel Class One Codes from the standpoint of porosity. Fig. 3 shows a weld which would be passable to these codes.

The lining being expensive both in initial cost and the cost of properly installing, it is advantageous to have a smooth surface to lay it against. Butt straps and rivet heads would not give us this construction. The design of a welded job gives a symmetrical vessel which is not only easier to support but the expansion and contraction strains are balanced throughout the structure.

Welding with Lincoln Equipment

The digester illustrated weighs approximately 76,000 pounds, has a wall thickness of 15/16 inch and a thickness through the head of 1⅛ inches. It was designed, built and inspected in accordance with the A.S.M.E. Class One Unfired Pressure Vessel Code for a working pressure of 100 pounds per square inch. The welding was done with equipment manufactured by The Lincoln Electric Company, Cleveland, Ohio, using Fleetweld electrodes.

Install Barking Drums at Bogalusa

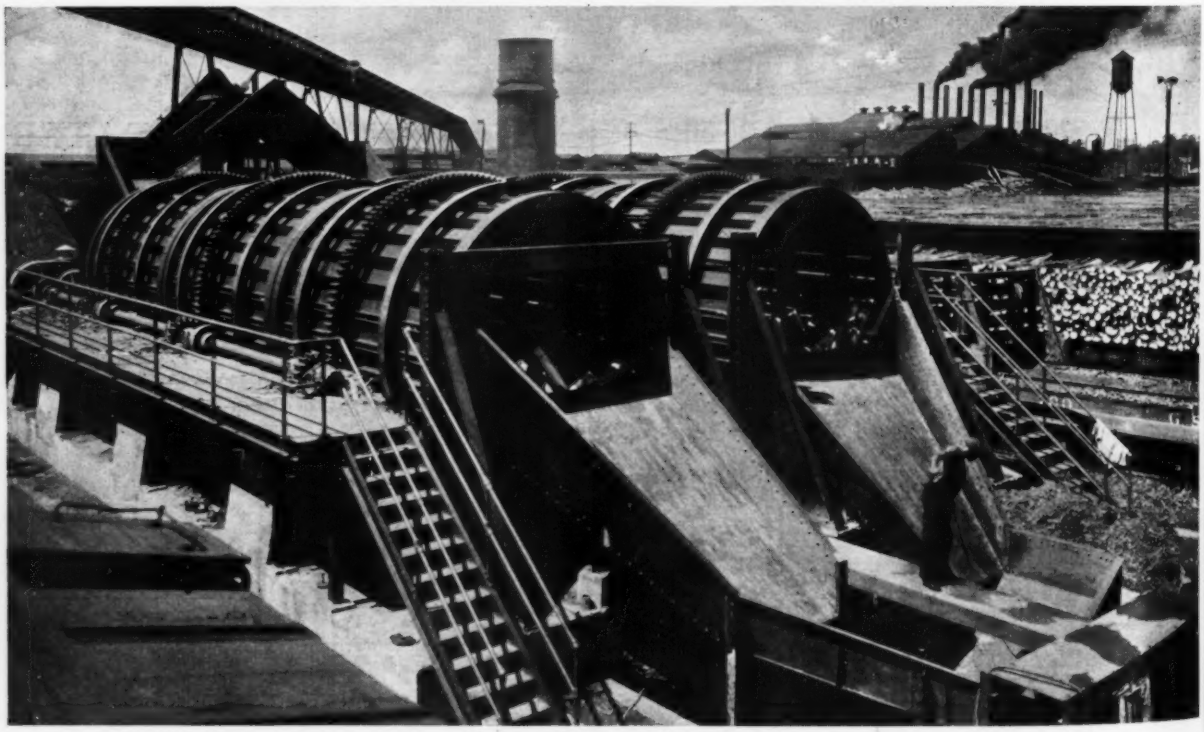
The two barking drums illustrated herewith have just been installed by the D. J. Murray Manufacturing Company of Wausau, Wis., in the modernized wood preparing plant of the Bogalusa Paper Company, Bogalusa, La. These are especially designed "Branch" barking drums and are 12 x 45 feet long. These barking drums and two "Murray" chippers completed the installation recently finished in this plant.

Both barking drums are installed in the wood yard to eliminate unnecessary handling of the unbarked wood, which is fed directly to the barking drums by conveyors from the wood pile, trucks, or railroad cars. The bark conveyors are unusually accessible by having them on one side of the foundation, which permits a walk-way on the opposite side. The feeding and exit hoppers are made of heavy steel plate construction and are provided with adjustable dams.

An unusual feature of the "Branch" patented barking drum is the heavy design and the totally enclosed reducer with direct connected motors of moisture-proof design. In these barking drums there is a semi-centralized lubrication scheme employed. Special steels were used in their construction in combination with the design of heavy sections of the drums to give unusual strength and do away with maintenance.

The patented feature of these barking drums is the integral lug construction which removes the working stresses from the bolts. The trunions of the drums are streamlined to assist in shedding the bark.

The two 96 inch "Murray" chippers installed in this same plant are the roller bearing direct connected to synchronous motor type. An unusual feature of these chippers is the bedknife arrangement and cutting angles to eliminate saw dust and to produce chip uniformity. In designing the chippers increased strength was attained by using a special steel and heavier sections. The new design of the chipper and motor provides easy accessibility to the rotor and stator of the motor, which is totally enclosed and cooled by individual fans.



BARKING DRUMS INSTALLED AT PLANT OF THE BOGALUSA PAPER CO.

IMPCO

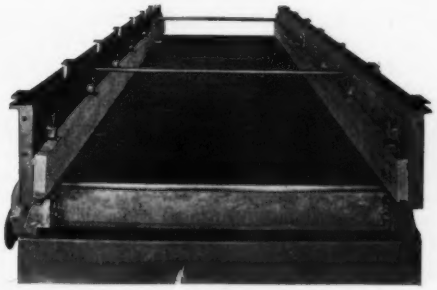
FLAT SCREENS with...

All Metal Vat..

PATENTS PENDING

Dunbar Drive..

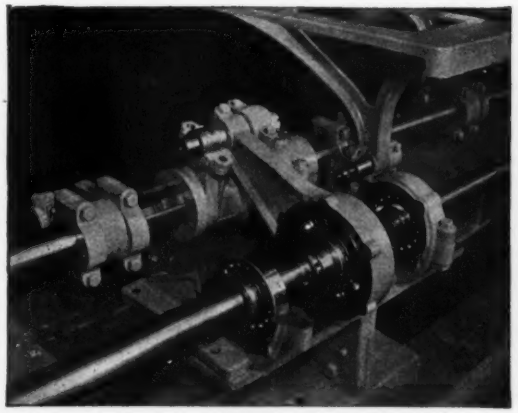
PATENTED



"IMPCO" Flat Screen showing bevelled plates locked in position with camber bar. Note streamline flow.

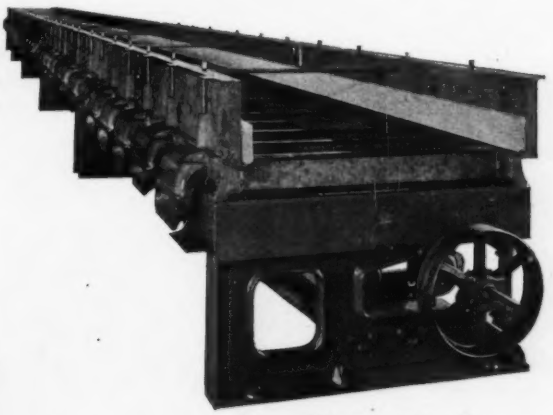
Paper and pulp mills are aware of the operating advantages provided by "IMPCO" Flat Screens, as evidenced by orders and re-orders being received.

THE DUNBAR DRIVE—Compact, Silent, Free from Vibration. This modern Drive assures positive, uniform stroke of the diaphragms, greater capacity with lower power requirements, approximately 1/10 H.P. per plate. Without cams or springs, it affords continuous trouble-free operation without frequent replacements. The Dunbar Drive embraces anti-friction bearings on drive shaft and anti-friction eccentric, removable bronze bushed bearings on rocker shaft, non-lubricated torsion bearings on rocker and pitman joints. Adjustable stroke eccentric can be furnished.



The "Dunbar Drive."

THE ALL METAL VAT—is permanent in character and minimizes possibility of sliming. In this type of vat, the objections formerly experienced in wood vats equipped with camber bar type of fastener are eliminated. Recesses in the vat side panels are provided for the camber bar locking screws insuring stream-line flow. Vat side panels butted—bridging eliminated. Diaphragms attached to screen plate supports can be replaced without removal of vat.



Five — Fourteen Plate Screens — bronze vats—in line.

IMPROVED PAPER MACHINERY CORPORATION

Nashua, New Hampshire

Appleton Vortex Beater Is Improved

The Appleton Vortex Beater during the last year has been changed materially and the beating action greatly improved by new knife design. This change has greatly increased the rate of circulation and permits the handling of stock at much higher consistencies. The result is much better and more rapid hydration of fiber as high consistency seems to be the most important factor in stock preparation in the beater.

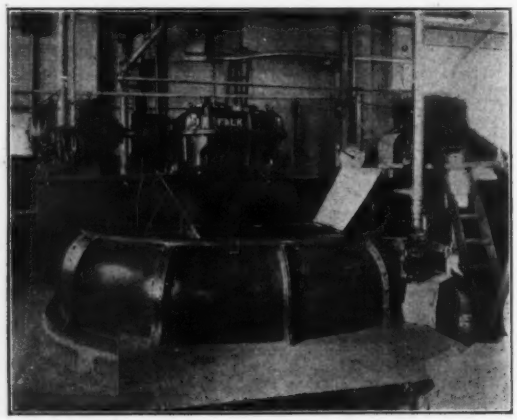
Vortex Beater Installations

Vortex beaters have been installed in the mills of the Thilmany Pulp and Paper Company, Kaukauna, Wis.; the Menasha Carton Division of the Marathon Paper Mills Company at Menasha, Wis.; Nekoosa-Edwards Paper Company at Nekoosa, Wis.; Sterling Pulp and Paper Company at Eau Claire, Wis., and the Interlake Tissue Mills of Merritton, Ontario. The manufacturers of the Appleton Vortex Beater, the Appleton Machine Company, of Appleton, Wis., have recently furnished jordans to the Nekoosa-Edwards Paper Company, the Menasha Carton Division of the Marathon Paper Mills Company and the Dunn Sulphite Paper Company at Port Huron, Mich.

Description of Vortex Beater

R. M. Radsch of the Appleton Machine Company describes the Appleton Vortex Beater as follows:

This beating engine marks a radical departure from the standard design and operating principles of the various types of beaters now in use. It was developed to improve upon the generally recognized inefficiencies in beater design and operation. Practically all of these deficiencies result from the horizontal flow of stock in the beater tub and consist of large floor space requirements; high power consumption used mainly in circulating the stock in the beater tub; slow rate of stock travel; small amount of stock subjected at one time to the beating action of the roll knives upon those of the bed plate; length of time required in completing and refining operation. The Vortex Beater using a cylindrical shaped tub occupies only one-half the space used by the standard type of similar capacity. The tub contains a bowl shaped stator to the bottom of which the knives are attached, corresponding to the bed plate in standard practice. The stator may be moved up and down for the proper adjustment of beating action. Inside and below the bowl shaped stator is placed the rotor consisting of a central axis to which are attached the impeller blades for stock circulation. The lower end of the rotor extends beneath the stator and carries on its upper surface the knives corresponding to the roll knives in the standard machine. The upper end of the rotor is direct connected to the speed reducer and motor.



INSTALLATION OF A VORTEX BEATER

Charged in Usual Manner

The beater is charged in the usual manner. As plugging is practically impossible very little time is required and a fifteen hundred pound machine may be filled with wet machine lap stock in five minutes. The impeller blade equipped rotor circulates the stock inside of the stator and forces it downward and between the rotor and stator knives. It flows up between the outer wall of the stator and the tub wall, overflowing over the entire rim of the stator and coming again in contact with the rotor action. As the total distance of stock travel is very short and the rate of travel quite rapid, a given volume of stock is subjected to the refining action of the knives much oftener than is possible with the present equipment. Complete immersion of the knives in stock results in active beating action of the total knife area during the entire time the rotor is in action as contrasted to the fractional roll knife acting on the bed plate of the ordinary type beater.

Beating Cycle Decreased

The impeller blade equipped rotor being an efficient propeller of stock and the total head through which the stock is moved being very low, together with the efficient beating action of the knives, a power saving of from thirty-five to forty per cent is effected and shown in mill operation. The time of beating cycle is considerably decreased as a result of rapid filling, emptying, rapid circulation, short distance of stock travel, and efficient knife action.

Features of Advantage

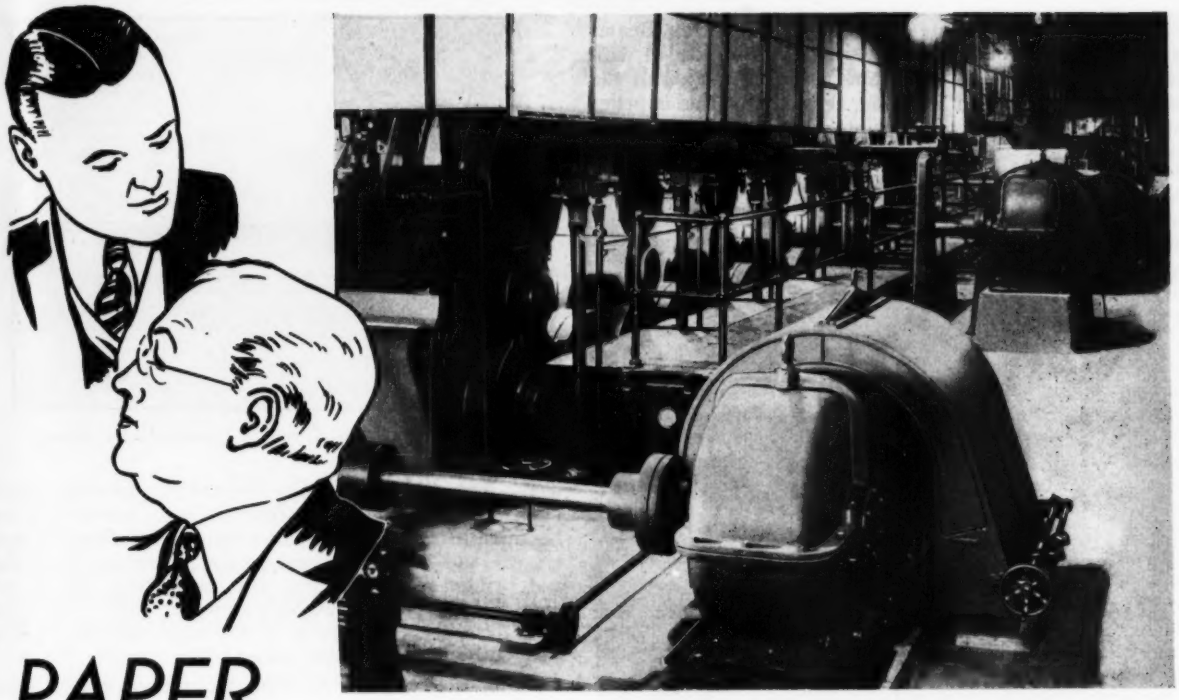
In addition to the preceding general structural and operating description of the Vortex Beater, attention is called to the following features of great advantage in the refining of paper stock:

The mechanical design of one of these units produces a compact, comparatively small and completely self-contained beating engine. Direct application of motor power through speed reducer to drive shaft utilizes the power required in the most efficient manner. The speed reducer furnished is the most efficient type obtainable for the purpose. The use of properly designed anti-friction bearings of ample capacity results in smooth and vibrationless running and effects additional power economies.

Covering the top of the beater with ½ inch steel plate makes for operating cleanliness. It also serves to carry motor and speed reducer, thus adding to the compactness of the installation. In fact the entire unit occupies only half of the floor space required by standard beaters of similar capacity.

The circulation of stock in the standard beater by means of the beater roll is very inefficiently done. Add to this the long distance the stock must travel in its circuit of the tub and we have the main reasons for large power consumption. In the Vortex Beater, circulation of stock is accomplished in the most efficient manner by the rotor equipped with properly designed impeller blades. This feature together with the short distance the stock travels in its circuit and the very low head against which stock is moved are the factors responsible for the low power consumption.

The rapid and thorough circulation of stock and the complete mixture which occurs are decided aids in establishing color mixtures and sizing in this type of beater.



A Set of Enclosed Type Spiral Gear Drives Operating on a 176" Tissue Machine

PAPER MEN AGREE . . .

That the MAINTENANCE COST AND POWER REQUIREMENTS OF OBSOLETE DRIVES is not only excessively high, but speed and production are directly affected.

That modern paper machine enclosed drives do demonstrate definite advantages in dollars saved in upkeep, and added earnings by making possible increased production.

There is little doubt that many machines are actually being handicapped by low efficiency driving units.

Old type drives consume EXCESSIVE POWER, which should be delivered to the machine. A modern drive unit with machine-cut steel gears and equipped with anti-friction bearings requires minimum power and is the efficient medium for power transmission from prime mover to the paper machine.

Enclosed type spiral or hypoid gear drives eliminate most of the noise and vibration in the machine room.

Modern drives make possible maximum operating speeds and definitely reduce costs.

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MODERN PAPER MACHINE DRIVES

One of the outstanding features of the Vortex Beater is the ease and rapidity with which it can be loaded with various kinds of stock. The rapid whirling motion of the material charged as it is being agitated by the impeller equipped rotor inside of the stator bowl, rapidly disintegrates raw stock into slush form allowing it to pass through the knives. Plugging does not occur as the plow arms at the bottom of the rotor constantly clean the knives of any bundles of material too large to pass through. Wet machine lap stock is assimilated as rapidly as it can be dumped into the beater. Five minutes will fill a fifteen hundred pound machine. Old paper stock, dried pulp and broke are rapidly disintegrated.

After all, proper beating is the essential qualification of a refining engine. This the Vortex Beater accomplishes most admirably. The radial position of both the stator and rotor knives, augmented by the circular movement of the stock produces a grinding action on the fiber passing between the knives which results in thorough brushing and hydration. The mere movement of stock in a beater has a decided hydrating action and the thorough Vortex Beater circulation is a decided aid in this respect.

In the standard type beater only a fraction of the roll knives are in contact with those of the bed plate at a given unit of time. In the Vortex type, the complete immersion of both stator and rotor knives in stock at all times means that all of the knives are doing their full share of the work all of the time. This insures a greater number of contacts of beating surfaces per minute and results in more rapid refining.

The beaters are dumped and washed out very rapidly. The compact nature of the tub together with the rapid circulation makes them practically self-cleaning.

Motor operated adjustment of beating action assures the easy and rapid manipulation necessary in securing the required degree of refining.

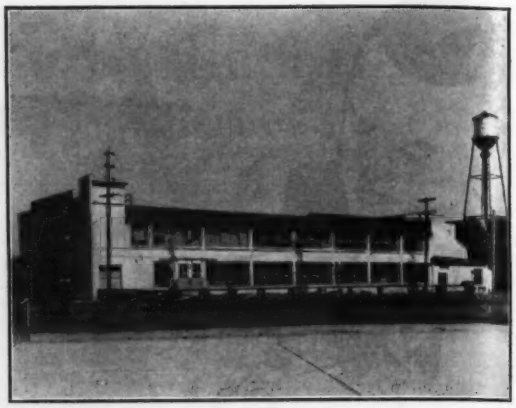
The high carbon chrome steel knives, requiring no woods, may be easily changed. Their cost is considerably less than that of the standard type equipment.

Badger Paper Mills Build Additions

Within the past year Badger Paper Mills, Inc., of Peshtigo, Wis., have made two important additions to their extensive property—a new converting unit, also an office and administration building.

Increasing distribution and continued development of plain and waxed paper specialties has demanded additional space, and in making the necessary arrangements, Badger Paper Mills provided for future expansion as well. The new three story reinforced concrete addition (68x160) houses the printing presses (another 72 inch Kidder press is being installed as this article is written), waxers and rewinders used in the manufacture of plain and printed waxed paper; also machinery for the production of popular household and wax rolls. An abundance of space is available in the cool basement, making ideal storage for waxed paper.

NEW OFFICE AND ADMINISTRATION BUILDING



NEW CONVERTING UNIT OF BADGER PAPER MILLS

As in the case of the converting unit, Badger's new administration building was constructed with the view of providing for future expansion. The attractive structure is beautifully landscaped, has private offices for the officials, commodious quarters for sales, purchasing, accounting and sample department. It is air conditioned, with ample recreation rooms, showers and has the most improved lighting effect to afford pleasant working conditions for the Badger office force.

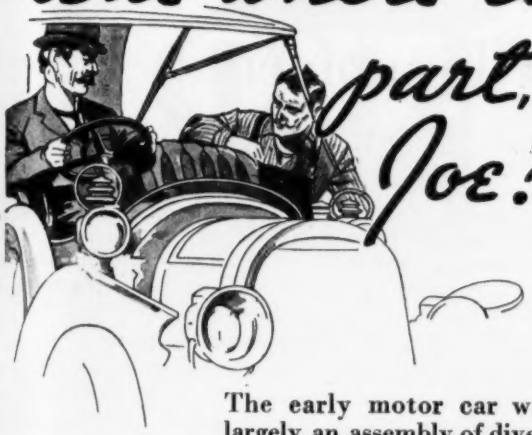
Ingersoll-Rand Installs Pumps

The Ingersoll-Rand Company, Phillipsburg, N. J., has recently issued interesting bulletins of the Cameron Paper Stock Pump and the Cameron Motor Pump. The company has installed a considerable number of its stock pumps which are rather a new development.

Among the outstanding features of the stock pump are an impeller that is easily removed and replaced on the shaft, by any mechanic, an adjustment made from the outside to compensate for wear within the casing, and a rotor assembly that may be quickly removed without disturbing the pump driver or dismantling any of the pipe to or from the pump.

The stock pump is widely used for various jobs around the mill such as handling light stock, fresh water and white water. This pump is so compact that it may be easily mounted in out of the way places and in some cases has been mounted directly on the board machines. One rather recent application in connection with board machines is to take white water from the bottom of the cylinder chest and boost the pressure through the use of the Motorpump and then pass the water back to the spray head or shower whence it is again sprayed back on the cylinder rolls for the purpose of cleaning them. This process it is understood gives a number of advantages, among which are reduction of the quantity of water needed from the original mill supply, a saving in horsepower over that required if fresh water is used in the showers, and better control of the pH content. It also makes possible easier maintenance of the correct shower pressure.

"But where can I get a new part, Joe?"



The early motor car was largely an assembly of divergent parts from many different manufacturers. Today, it is a unified mechanism, every part manufactured by or to the strict specifications of the manufacturer. There is *one* responsibility for its proper functioning, and effective standardization in replacement parts.

Why not insist on the same uniformity, the same single manufacturer responsibility in your plant piping? Of all places in an industry, that's where you need to practice economy. That's where you must maintain constant vigil against waste and maintenance costs. That's where uniformity in design, manufacture and *integrity* return the greatest dividends. Interchangeable parts, small stocks, a ready source of supply—and a manufacturer who takes responsibility for the whole piping job.

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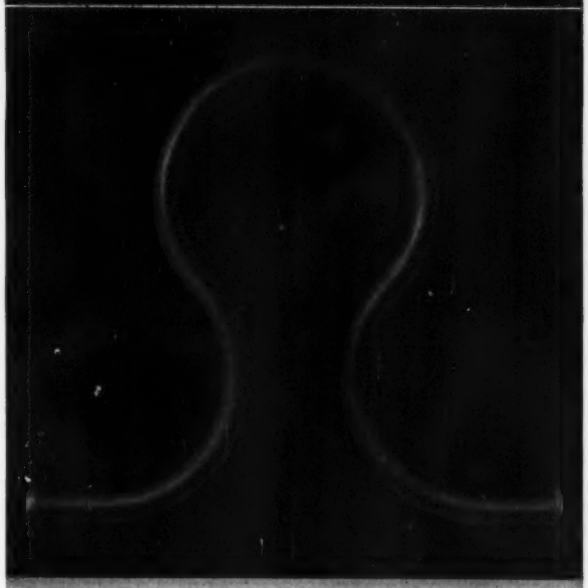

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3 Connecting ends of bends may be threaded, beveled for welding, flanged and refaced or Cranelapped for Vanstone joint.

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Outstanding Opportunities in Modernization of Electrical Mill Equipment

By A. F. Betke[1]

As part of a modernization program, a progressive paper-manufacturing company equipped the wet end of its cylinder-type board machine with an electric drive. The equipment cost $8,000 installed. Not long ago, the general manager of the company stated: "The drive has more than paid for itself in the first year of operation, bringing us a remarkable return on the investment. We find that a large direct saving has been realized in the reduction of felt costs alone. In addition, a wider sheet can be produced than formerly, as a result of reduced felt stretch; less steam is required in the drier; and the finished product is stronger and of better quality."

Examples such as this are not cited to infer that modernization is necessarily the answer to all problems concerned with reducing high costs of production and increasing profits. But widespread experience indicates that the right kind of modernization carried out by competent engineers does reduce costs and increase profits. Such modernization frequently makes possible the use of methods and materials heretofore considered impossible and affords a flexibility in manufacture previously not deemed practical. Many industrial executives are giving considerable thought to this subject today, particularly because of changing economic structures and its relationship to business recovery and corresponding opportunities for increased earnings.

The Basis of Business Plans

Individually and collectively, as wage-earner, salaried employee, company, or industry, we are intensely interested in recovery. This is far from being a new thought, but it is an important one because, after all, it concerns the very basis of our business plans and even our standards of living. Recovery may be the result of three factors: First, an increase in production based upon natural growth; second, an increase in production brought about by manufacturing products of a quality and cost that better meet the competition; and, third, an increase resulting from activities leading to new markets, such as development of new or better products or application of present products to new uses.

Production Increasing

Recent reports show that production in all lines is increasing. Is this increase caused by natural growth, development of present market, or exploitation of new markets?

Because of economic conditions, there has been little expansion based upon natural growth, and it is safe to say that the gains which have been made have resulted largely, if not exclusively, from improvements in equipment and methods which are operating to reduce manufacturing cost, improve quality, and thus open a field for the use of paper and paper products in new ways and in broader markets. In fact, scientific discoveries and new developments are making possible such outstanding economies and affording so many other advantages that annual returns of 50 to 100 per cent on investments for new equipment are not unusual. As a result, many executives have reached the conclusion that with current volumes one of the safest and most profitable places to invest capital is in their own plant.

Machinery Manufacturers Cooperate

Of inestimable value to these executives is the fact that machinery manufacturers recently have developed and placed on the market new equipment built to provide higher operating efficiencies and turn out higher quality products, in many cases at a lower cost of production than could heretofore be achieved. Many of these machines require the use of modern and efficient electrical equipment to produce the desired results.

Progressive executives in the pulp and paper industry realized, some twenty-five years ago, the advantages of electrification and adopted it in their mills to reduce costs and produce a commercial product superior in quality, strength, and finish. In the last few years, the leaders have not forgotten the benefits that accrued to those mills which were the first to adopt electrification. Profiting from that object lesson they have taken advantage of new machines, new materials, and new electric equipment to cut production costs by maintaining a higher degree of operating efficiency. They have, in other words, been alert to the opportunities offered by the right kind of modernization.

Examples of Profitable Modernization

Perhaps one of the outstanding developments in the last few years is the one mentioned in the introduction of this discussion and employed in the modernization of the wet end of cylinder machines. An auxiliary electric drive on the wet end of these machines materially reduces felt costs, increases production on the machine by taking more water out of the sheet at the wet end, and improves the strength and finish of the product—all of which not only means larger earnings but a bigger market. A number of these wet-end auxiliary drives have already been installed and are paying substantial dividends to the users through reduction of operating cost and improvement of product.

Many mills have found that operating efficiency could be improved by superimposing a high-pressure turbine on an existing power plant, thereby producing all the steam required for drying, heating, and digesting processes, and at the same time securing electrical energy. The cost of producing high-pressure steam is in most cases only slightly more expensive than producing moderate-pressure steam. By piping high-pressure steam through a turbine and either extracting or exhausting into a moderate-pressure turbine directly or to the process main, both the process steam and the electrical energy are produced very economically. Here, too, returns on the investment have paid big dividends.

Other mills have found that by improving plant power factor the load on present generating equipment could be increased. Some mills have replaced induction motors

[1] Industrial Dept. General Electric Company, Schenectady, N. Y.

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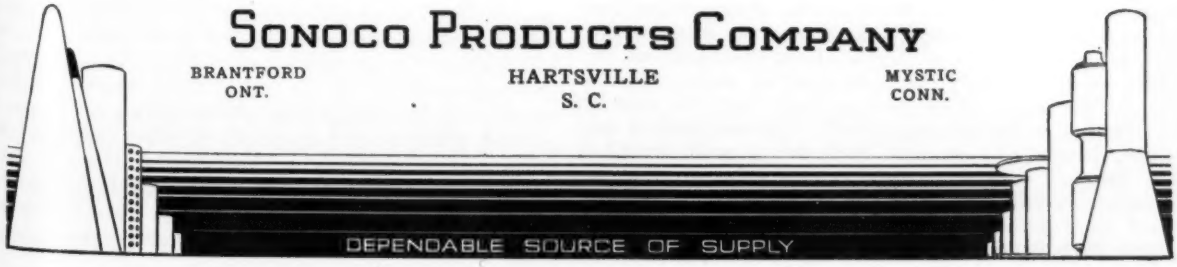


with leading-power-factor synchronous motors or installed capacitors in order to improve the plant power factor. Other mills have converted large induction motors to synchronous motors in order to accomplish the same result. In one case, $11,700 invested by a paper mill in this manner resulted in a 32 per cent annual return on the investment.

Modernization of Rewinders

Modernization of rewinders has proved to be a source of additional revenue. The power wasted by mechanical brakes on a rewinder operating at high speed on heavyweight paper and the uneven rolls produced have been a source of annoyance. Recently, these mechanical brakes have been replaced with a regenerative-braking constant-tension drive that not only reduces the power consumed in rewinding heavy sheets but produces a tight, uniformly wound roll which in turn can be unwound at high speeds to the very core. This has resulted in better satisfied customers for one mill and in increased orders because of the high-quality roll being produced.

Opportunities for Modernization

The paper machine is probably the most important single machine in the mill. Continuous operation is essential, requiring a flexible, dependable, low-maintenance drive engineered to the particular requirements of the machine under consideration. Whether this paper-machine drive should be of the sectional type, the single-motor type driving a back-line shaft, or a mechanical turbine driving a back-line shaft is determined entirely by the economics of the installation and the results desired.

On some machines, where provision must be made for process steam, a non-condensing variable-speed mechanical-drive turbine serves the double purpose of providing clean-low-pressure steam and a source of mechanical energy. Where the back-line shaft is in excellent condition, a turbine may be more economical in operation than some other type of drive.

On other machines, single-motor adjustable-voltage drives may prove themselves less expensive from an installation and operating viewpoint. Here, where speed regulation is of extreme importance in producing a uniform product, a recently introduced new type of regulator offers improved characteristics commending its use in modernization programs. It is simple and rugged in construction, requires practically no attention other than for minor adjustments, and is designed to hold the speed of the paper machine within close limits.

The Matter of Speed

On new machines or old machines requiring a new back-line shaft, a sectional drive can easily be justified. Until recently it was conceded that if some means was provided on a paper machine to assure constant speed as a whole after the speed had been set, then the most that could be done by a drive builder had been done. Careful observation of paper-machine operation demonstrates that this conclusion is a fallacy. There are three separate and distinct speeds to be considered. First, the speed of the whole machine during the production of paper; second, the relative speed of the section; and, third, the rate of acceleration or deceleration from one fixed speed to another. Recently, a sectional drive for a paper machine was designed with these requirements in mind; that is, it maintains constant operating speed, constant relative speed, and uniform acceleration and deceleration. Chief among its advantages is the ability to assure quality of product, reduce outage time, simplify operation, and reduce maintenance costs.

Here, before passing on to a discussion of other mill requirements, it should be noted that on certain older types of drive a point has been reached where the cost of maintenance, outage time, and low operating efficiency have increased to such an extent that new equipment could be installed which would soon pay for itself and then add to earnings.

Modern drives of the double-motor a-c type and enclosed herringbone reduction gear units may be used with supercalenders to provide constant speed for threading, smooth acceleration, and constant speed for calendering, thus saving time of the operator, reducing the number of paper breaks, and lowering operating costs. In addition, because of the simplicity and accuracy of the control, production is increased.

Then there are modern air- or oil-circuit breakers and switchgear equipment which minimize interruptions and afford protection to machinery and electrical equipment. Improvements have been made, too, in the design of control and motor-starting equipment providing overload and undervoltage protection. The use of such reliable, modern switchgear and control equipment in effect provides low-cost insurance on capital invested in machinery and electrical drive.

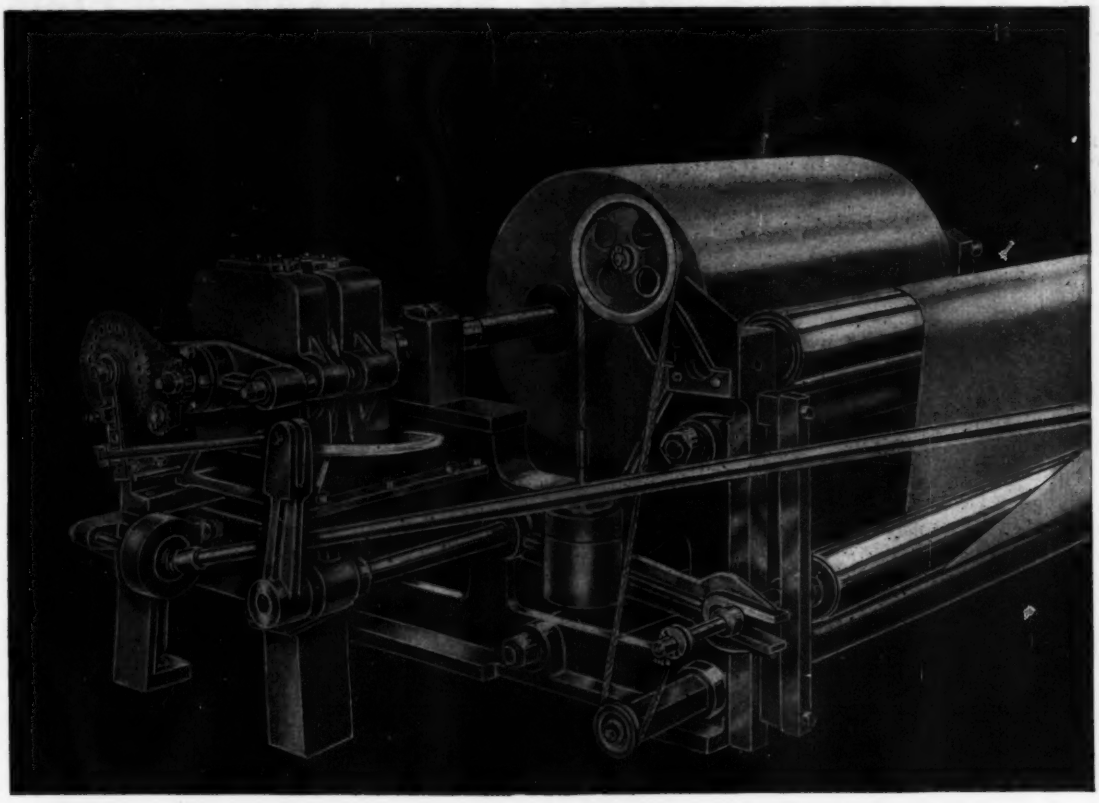
In addition to the possible sources of revenue mentioned, there are many others which offer promising opportunities but which cannot be considered in the space available here.

Where to Modernize

The places where modernization investments can be made to increase earnings are many and varied and, in general, depend on the process, operating conditions, and type of equipment employed in the individual mill. Broadly speaking, modernization will be profitable when equipment has reached a point where, because of old age or wear, its maintenance becomes so high that it is cheaper to install new equipment than to pay the high cost of repairs for the old. When this condition exists, more money may be wasted in operating obsolete equipment, which adds to losses indefinitely, than is needed to buy modern, improved equipment which pays for itself and then adds to earnings. A second condition might exist where through wear or obsolescence the machine lacks accuracy and its use results in considerable waste of product and labor. Here, too, a capital investment for a modern unit should add to earnings. As a third consideration, the equipment may be operating successfully but new developments and increased operating efficiencies may permit the same work to be done at such a decrease in cost that a capital expenditure can be liquidated in a reasonable length of time.

Many Other Tangible Benefits

In addition to the direct economics which can be evaluated in dollars and cents, it should be remembered that practically every investment for the right kind of up-to-date equipment and methods results in many other tangible benefits, the importance of which must be gauged by the individualities of the mill. These benefits might be summarized as greatly improved operating conditions, increased reliability and continuity of service, greater flexibility and adaptability to changing conditions, and a stronger competitive position made possible by improved quality of product and, consequently, greater consumer acceptance.



NEW
AUTOMATIC WEB TENSION DEVICE

Assures uniform web tension

regardless of changes in speed or of mill roll diameter

The Automatic Web Tension Device here illustrated is of great value on any processing machine that includes the unwinding of a web from a roll. It provides uniform tension on the web of material whether paper or fabric, regardless of the change in speed of the slitter, press, or other processing machine to which it is attached.

This device permits a press, for instance, to be stopped and started up again without changing the register on the printed web, such as would occur with a manually operated mill roll friction control, due to variation in the web tension.

The control of the web is secured by a counterweighted floating roller, over which the web passes. The uncounterweighted weight of this roller therefore, determines the tension and this roller directly controls the braking element by means of a system of levers and gears. The tension, therefore, being controlled directly from the web is properly controlled, independent of the diameter of the roll being unwound. Water cooled mill roll friction assures smooth cool running at high speed.

This device is entirely mechanical in operation, so there are no electrical parts to get out of order. The roll can be adjusted to the handling of light or heavy materials, by increasing or decreasing the amount of counterweighting. A very sensitive control can thus be established.

CAMERON MACHINE COMPANY

61 Poplar Street **Brooklyn, N. Y.**

A Forward Step in the Control of Paper Drying

By A. H. Stanton[1]

In line with the requirements of the paper industry for improved control, there has recently been perfected a dual element control for paper machine drying. This control, referred to as Tenso-Temp, derives its name from the joint action of the tension control unit and a temperature control unit on one air controlled system governing the position of the steam admission valve supplying steam to the dryers.

Well Known to Paper Industry

The art of tension roll control directly governing the position of the steam valve feeding steam to the drivers, is well known to the paper industry. Almost as well known to the industry is the use of temperature control with pressure compensation for paper machine drying.

It is recognized that when the sheet moisture changes the tension roll position is changed and this change in position is utilized to reposition the steam valve to prevent the sheet varying in its moisture content. Primarily, this change in moisture content originates on the wet end of the paper machine, such as changes in basis of weight, or stock density and freeness. If all wet end conditions were uniform then it would be true that the sheet going onto the driers would be at a uniform condition and it would only be necessary to supply a uniform heat input into the driers to produce a uniformly-dried sheet going onto the reel. Therefore, if newsprint or a continuous order is being handled, the wet end conditions can be fairly uniformly set and this leaves the humidity effect of air passing by the dryers which on a change can vary the final moisture content of the sheet. Generally speaking, after the machine room is warmed up this air humidity change is relatively slow, usually taking a long period of time to become effective, and if temperature control is used for drying, the need for resetting the control point to preserve a uniformly-dried sheet is quite infrequent.

Frequent Attention Required

However, on machines which change orders frequently with attendant necessary wet end adjustments, the use of temperature control for drying requires frequent attention by the operators to make the correct reset of the temperature control point. In this respect, the tension roll control automatically makes these resets and is much to be preferred.

In cases where the tension roll is directly repositioning the steam valve without any intermediary factor, there is the ever-present time lag to balance out in order that the steam flow to the machine may be uniform during the time that the sheet condition is uniform. This time lag can be readily appreciated if a sheet change in moisture is visualized, the controller starting to reposition the steam valve to balance out for this change, but with, say a five-minute interval taking place between the time that the steam valve moves and the additional heat being transferred through the dryer shell back into the sheet to balance out for the change in moisture. Without any intermediary influence, the tendency for the steam valve is to remain open too long so that an excess of heat is transferred into the sheet, the tension roll responding in the opposite direction to this but in turn, cutting off the steam supply beyond the required amount so that the next reaction from the sheet is from the wet side. Thus, a cycling or over-control action is set up which, depending upon the individual machine, may create a serious variation in sheet moisture content of itself.

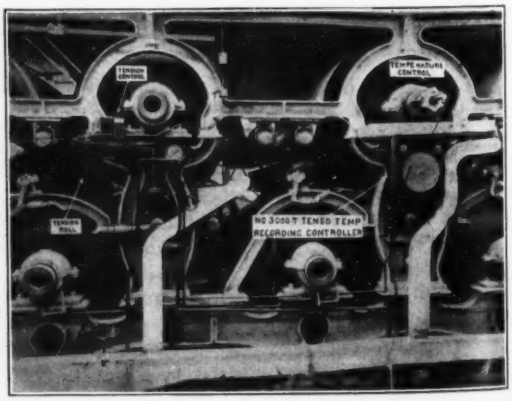
Operation of the System

The Tenso-Temp System operates as follows: as long as the sheet tension is uniform the temperature control unit is in control. At this point, let us visualize a change in the initial steam supply in its pressure, i.e, or temperature, and we can readily appreciate that this will react first on the temperature control unit, which, in turn, will cause a reposition of the steam valve before the change in heat can work through the dryer shell and create a reaction from the tension control unit. Thus, the control is anticipatory in its action from this source. The reaction from the temperature control unit is stabilized by means of an integral diaphragm valve compensator which is reacting on the instrument pilot system, so as to prevent overcontrol from this reaction.

When the sheet condition changes, then the tension control unit responds and now controls the steam valve to reset the temperature control point. The sheet going on the wet side opens the steam valve and promptly increases the temperature in the dryers, at this moment the control is transferred to the temperature unit anticipating and eliminating overcontrol. The sheet change is therefore provided for and balanced at a new rate of heat input to the dryers proportional to the moisture variation. The control is so designed that a very slight change in location of the center of the tension roll can throw the steam valve through its full travel with subsequent transfer of the control being made by the tension unit.

Extremely Flexible Control

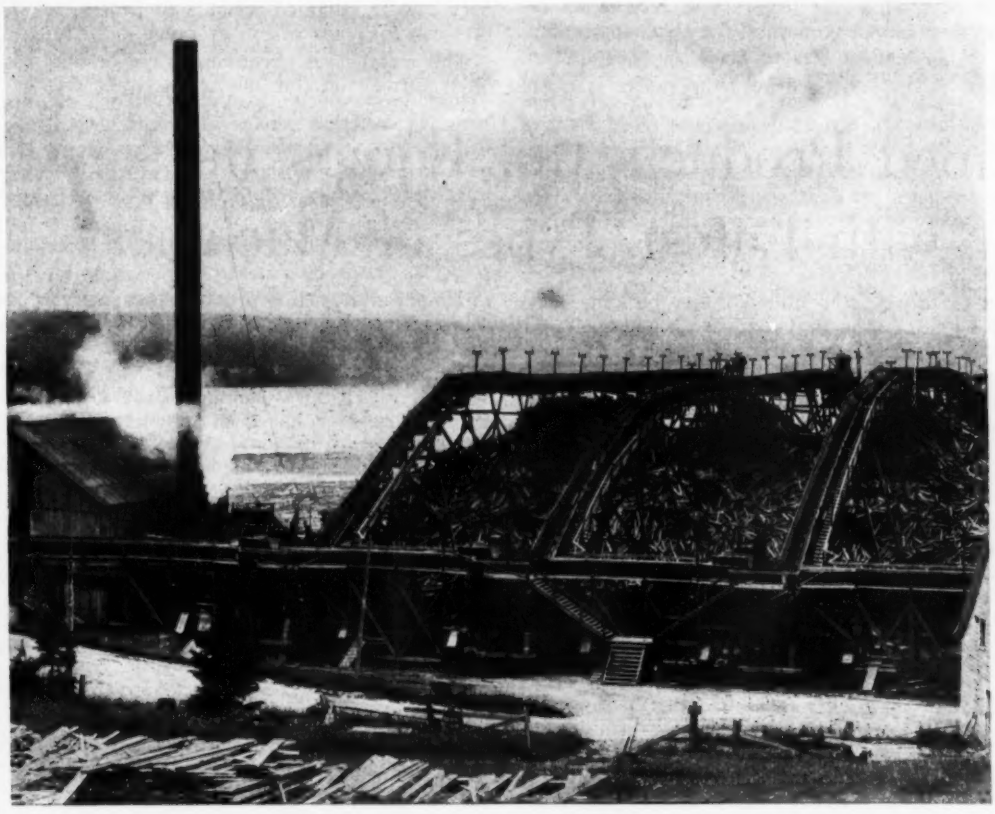
This dual control is extremely flexible in the manner in which a break can be handled. The break control can be made fully automatic by permitting the lever of the tension roll to fall on a contact switch energizing a solenoid valve shutting off the air pressure to the control system and thus causing the steam admission valve to close. Similarly, when the sheet again picks up the tension roll the contact is broken, air turned back onto the control and the system is again in operation.



A Typical Installation in an Eastern Paper Mill of the Control Described

[1] Pulp and paper mill sales engineer, Mason-Neilan Regulator Co., Boston, Mass.

Here are the Facts about Quaker Keystone CHLORINE



Into the mill go the logs . . . paper in embryo form, while Quaker Keystone Brand Chlorine waits to lend its efficient aid.

No matter where your plant may be located, Quaker Keystone Chlorine will come to you quickly and safely.

Our plants are established in all parts of the country. Deliveries are made in single unit tank cars of 16 and 30 tons each and multi-unit cars of 15 one-ton containers. . . . Also small cylinders of 100 and 150 pounds capacity.

Behind this Quaker Keystone service lie the many years' experience which have created the present demand for this quality chlorine in the paper industry.

You, too, may enjoy all the advantages of this service, which includes expert advice by our technical staff, who will gladly assist in working out manufacturing problems involving the use of chlorine.

Write us about your problems today!

Other Chemicals for the Paper Industry

CAUSTIC SODA · SODIUM ALUMINATE · PENCHLOR (*Super-test Calcium Hypochlorite*) · PENCHLOR ACID-PROOF CEMENT · ALUM · ANHYDROUS AMMONIA · BLEACHING POWDER (*Standard Strength*) · CARBON TETRA-CHLORIDE.

Est. 1850 PENNSYLVANIA SALT MFG. CO.

TRADE MARK

EXECUTIVE OFFICES, WIDENER BLDG., PHILADELPHIA, PA.

Branch Sales Offices: New York—Chicago—St. Louis—Pittsburgh—Tacoma—Wyandotte

If desired, the back tender may throw the tension lever to the dry side which will shut off the steam and cause a drop in temperature to the minimum setting of the temperature control unit at which time the steam will be automatically turned back onto the dryers to prevent further decrease in temperature. When the sheet is fed back and the tension lever released, the control will again go into operation.

The back tender, if he desires, may permit the tension lever to fall after the break and while the steam will momentarily be turned on full there will be a maximum temperature which when reached will be automatically maintained so that while the dryers will receive an increase of heat, they cannot go beyond the above maximum.

Continuous Record Made

A continuous record of the drier temperature is made with this system, for the purpose of providing a record as to the running sheet condition. For example, if it is observed that the temperature control point is being reset frequently the machine tender knows that his wet end operation is varying accordingly and can use this guide to ascertain what part of his wet end is varying and take steps to remedy the condition.

The operation of the control is simple and once the control is set at the beginning of the order practically no further attention on the part of the back tender is required. It is only necessary to balance the tension lever with weights for the particular draw of the sheet and possibly over a wide range of weights of orders, set the temperature control point within its range.

This simple, yet effective, system of dual control is another forward step in the art of paper drying.

Gummed Products Co. Equips Its New Mills with Latest Types of Machinery

In addition to the quarter-million dollar building program started by the Gummed Products Company, Troy, Ohio, makers of Trojan Gummed Paper, Sterling "Tread" Gummed Tape and Trojan Box Tape, six months ago, the most modern developments in machinery are constantly being installed in its new mills, the construction work on which is practically completed.

All three divisions of the company's business are being affected by this new machinery which not only tends to increase production, to further enhance its service to its customers, but to broaden its activities and to permit an even greater degree of control over the quality of its products. Consideration is also being given to the fact that the company contemplates having several allied lines in the near future.

Trojan Gummed Paper Mill

Among the larger machinery to be installed in this mill is an 80 inch sheeter equipped with automatic layboy, also an automatic counter and ream marker, all of which will speed up these important operations and create a foolproof protection against sheets not up to Trojan Standard finding their way into each ream of Trojan Gummed Paper.

A 96 inch Seybold Guillotine Cutter has replaced one of smaller size, to increase the capacity of the cutting department.

New laboratory equipment has been installed to permit a wider range of tests in maintaining and further enhancing the quality of Trojan Gummed Paper. At the present time the laboratory is operating 24 hours a day, paralleling the production of the mills.

In recent months one of the especially built "Processing" machines was completely rebuilt to take a wider roll and to increase the production on flat papers.

Sterling "Tread" Gummed Tape Mill

Sterling "Tread" Gummed Sealing Tape is an exclusive development of the Gummed Products Company. "Tread" Gumming, protected by U. S. Patent No. 1,978,631, provides a number of special advantages which are summed up as follows: smoother corner folds, faster sticking, permanent adhesion, does not permit water to ooze out at the sides, and freedom from side-slip.

In this mill, two 72 inch Camachine High Speed Slitters, equipped with the latest type of water-cooled frictions which permit a slitting production capacity of 1400 to 1600 feet of Sterling "Tread" Gummed Tape per minute, have been installed.

To meet an increasing demand for high-grade printing of Sterling "Tread" Gummed Tape a new high-speed 3-color rotary press has been added to previous equipment.

Other new equipment includes a complete wood core making machine with a capacity of 1000 to 1500 cores per hour and a special press for printing the cores.

Trojan Box Tape Mill

For the purpose of further improving the service on box tape, several changes in present equipment are being contemplated. This is in the sense of improvement and replacement.

A new Special Cloth Slitting Camachine, was also installed within the past year.

As soon as the mills reach their strides from a production standpoint, which will be dependent upon how soon the contractors pronounce their work completed, a close check will be kept on activities to determine whether additional equipment is needed.

Right now, in anticipation of the company's entering into allied lines, another substantial and special machine is being built, to the Gummed Products Company's specifications. The special nature of the machine does not permit further discussion of it here.

It is the aim of the officials of the Gummed Products Company to let nothing interfere with their plans to make these mills as completely equipped and as efficient in operation as careful planning and modern facilities will permit. When the plant is completed, it will be the largest, most modern and most complete gumming plant in the United States, especially built for this purpose.

Complaint Against Brenner Paper Mfg. Co.

WASHINGTON, D. C., October 30, 1935—The Federal Trade Commission has issued a complaint against Brenner Paper Manufacturing, Inc., of New York City, charging that throughout its business transactions since March, 1935, this company has represented itself as a paper manufacturer when in fact it is a converter and printer. The respondent is given until Friday, November 29, to show cause why the Commission should not issue against it an order to cease and desist from the representations alleged.

"Stainless" in the Paper Industry

By J. C. C. Holding[1]

The paper industry has perhaps more than any other challenged the resourcefulness of its engineers and metallurgists to cope with the corrosion problems which it presents. From both the standpoints of perfection of product and economy of operation, the challenge is insistent. A discolored product reduces marketability and short lived equipment increases operating costs.

Mills Looking for One Hundred Per Cent Cure

Possibly the reason that comparatively little progress has been made in the installation of improved equipment is that the mills are looking for a one hundred per cent cure for their troubles and would rather go on as heretofore than accept materials of construction which even though conceded to be a great improvement are still not perfect.

Experimental Installations Show Good Results

There is no commercially practicable metal or alloy now known that will stand up forever under the severe chemical punishment to which most paper mill equipment is subject. The straight chrome, chrome nickel, and chrome nickel molybdenum alloys, however, have amply demonstrated their superiority over ordinary carbon steel and over other alloys. Of course the expense has been the factor preventing their more general use, together with the fact that they do not completely solve the problem. Fragmentary experimental installations have been made with good results, but perfect service has not yet been attained.

Tests in a Sulphite Mill

In an eastern sulphite mill two elbows of straight chrome iron are being tested in the relief line of a digester. They have been in service over two years and are still apparently as good as when installed. Chrome nickel castings in similar service at other mills have lasted six years, but of course no perpetual guarantee can be given for either material. Meanwhile some of us cannot help inquiring why the industry should waste valuable time waiting for demonstrated perfection when the chrome alloys have already proved their vast superiority over ordinary steel and at prices which are not prohibitive.

Other Sulphite Tests

In the same sulphite mill three lengths of two inch alloy pipe have been in service for more than a year on three digesters. One is a straight 27 per cent chrome alloy; the second an 18 per cent chrome, 8 per cent nickel alloy; the third a 27 per cent chrome, 4.5 per cent nickel, 1.5 per cent molybdenum alloy. At the end of the first six months all were giving good service. Some slight pitting was apparent on the straight chrome iron pipe but this may be due to galvanic action as all three of these pieces of pipe were screwed into bronze flanges for the express purpose of testing the relative intensity of galvanic action between bronze and the three alloys. If flanges of the same analyses as the tubes had been used it is possible that no pitting would be in evidence on any of them. Certainly every one of the three alloys used has stood up better than extra heavy brass pipe in the same service. Again we inquire "Why not try out a real installation of the cheapest of the three"?

Coming now to the paper making processes we find that straight chrome iron of the lower chrome percentages is doing a wonderful job in beater bars. Some quite large installations of 14 per cent chrome alloy bars have been made and no adverse criticism whatever has developed over several years.

A Logical Conclusion

Since the original Stainless steels, or straight chrome iron alloys, won their reputation in cutlery service on their resistance to corrosion in fruit juices, ordinary air and water nothing could be more logical than that these alloys might be profitably used for pipe and fittings in water supply lines particularly where complete elimination of iron rust traces in fine papers is desired. The use of an alloy containing much less than the accepted minimum for cutlery (which is around 14 per cent) say down to 5 per cent would be a vast improvement over present common practice for water lines. Apparently, however, no mill has yet seen fit to go to this expense and the advancement of the industry has thus been retarded.

Changes Expected To Be Rapid

Admittedly, progress in overcoming corrosion in the paper industry has been slow. It was slow in the oil industry and in the textile industry until quite recently. These latter industries, however, are now using increasingly large quantities of corrosion resisting alloys in their equipment with most satisfactory results. This will eventually be true of the paper industry also. The general use of chrome alloys or other corrosion resisting materials will not be delayed until the industry as a whole is convinced that they are economical, but just as soon as any one plant accepts the tests as conclusive and decides to install a complete stainless unit, the revolution will start. Once started the change will be rapid.

[1] Vice President, American Stainless Steel Co., Pittsburgh, Pa.

New Kidder Press at Kalamazoo

A high-speed, roll-to-roll, arc-type press has been installed recently in the plant of the Kalamazoo Vegetable Parchment Company by the U.P.M.-Kidder Press Company of Dover, N. H.

The press is for a 5-color web-to-rewind product and operates at speeds of from 500 to 700 feet per minute, taking a web 65 inches wide.

"Arc-type" construction—grouping the plate cylinders in an arc around a single impression cylinder—is the basis of this roll-to-roll press.

The patented Kidder form roller setting device is a feature of this new press. It eliminates roller gauges and makes it possible for the operator to walk into the press to adjust form rollers to vibrators and plate cylinder at will.

Perhaps the outstanding thing about this "Three-Point" Press is the fact that in spite of the high speeds obtainable with it, the type of register specified by Kalamazoo was obtained from the start of operation.

K. V. P. paid tribute to the craftsmanship of Kidder in a letter in which they said in part, "We are more than delighted at the performance . . . Our hats are off to you as master workmen."

This type of press is flexible of design and can be made to conform to any specific printing needs.

The Biggest Sawdust Pile In the World

To convert waste products into useful articles is one of the most interesting phases of modern industry and while the citizens of Chegoygan, Mich., may point with pride to "the largest saw-dust pile in the world," accumulated during the timber-boom of the '90's, that modern industry is not proud of this waste is shown by an inscription on the waste burned at Bogalusa, La., which reads:

"Every day during my life of sixteen years I consumed daily 560 cords of waste wood or a total of 2,688,000 cords. It cost $75,000, but my fire has destroyed $1,344,000 worth of what was formerly considered waste. The complete utilization of sawmill refuse in the manufacture of paper has my fire forever extinguished."

Waste Elimination in Paper Mills

Bauer pulpers have made many contributions to the elimination of waste in pulp and paper mills, being used to refine ground wood screenings to join with accepted stock for news. Ground wood and sulphite screenings are also refined and made into wrapper or finished stock, thus, material formerly dumped into the river is converted into a saleable article.

The use of Bauer's on sulphite and sulphate screenings has modified former processes. When regarded as waste, the practice was to regulate by the amount of chemicals, or the cooking time so that a minimum of screenings was produced, but with the Bauer refining the screenings into acceptable stock it is possible to reduce either the cooking time or the amount of chemicals, thus producing more screenings. This method of operating reduces the cost of the entire process.

Most Economical Method of Operation

The most economical method of operating the Bauer on screenings is to return the refined Bauerized stock to the screen where the refined stock is accepted, thus the unrefined portion along with screenings from the primary stock is returned for further treatment. It requires less power per ton of stock to operate the Bauer so that the Bauerized stock consists of 75 per cent acceptable stock and 25 per cent stock which is not small enough to pass the screen than to set the Bauer to refine all of the stock

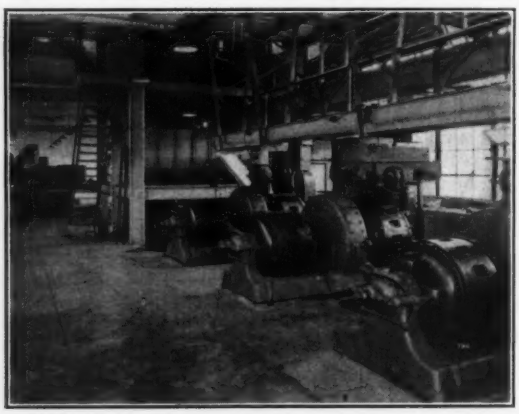


FIG. 2

A partial view of the Bauer Pulp Laboratory showing three Bauers in the foreground. The center Bauer is equipped with a feeder for handling bagasse, straw, etc. Three other buildings adjoin the one shown which house the forming machine, digesters, shredder, etc.

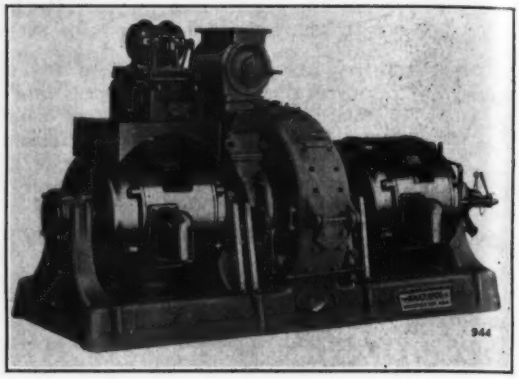


FIG. 1

The Bauer Pulper. The rate of feed is controlled by the variable speed transmission and the space between the plates is adjusted by the handle at the right end.

in one pass through the machine. This method has a further advantage in that it is impossible for any stock to go onto the machine which has not been accepted by the screen.

The most extensive use of Bauer pulpers is in the production of insulation board most of which is manufactured from the waste product of various industries such as bagasse, wheat straw, corn stalks, saw-mill waste, etc., as well as that which is made from new wood. The Bauer is particularly well suited for the manufacture of insulation board due to its characteristic of maintaining fiber length.

The Essential Elements

The essential elements of a Bauer consist of two 36-inch diameter discs facing and paralled with each other running at comparatively high speeds in opposite directions, sectional plates with a roughened surface being bolted to the face of each disc. Stock enters at the center of the disc and centrifugally moves towards the outer periphery during which period the fiber bundles are rolled, crushed and twisted, an action which separates the individual fibers with minimum reduction of fiber length. Action of the plates on the fiber bundles may be compared to the act of rolling a pencil between the palms of the hands, such a rolling action does not tend to cut fibers but rather to separate and to produce fibrillae which gives a felting action so desirable when the stock is run on the machine.

The conventional method of producing insulation board is to convey the stock from either the chipper or cookers (depending upon whether or not the material is cooked) to a Bauer fibrator. The principal of this machine is the same as the pulper, but it is equipped with specially designed plates which does not refine the stock but evenly reduces it to insure uniform refining action by the pulpers. This machine has a large capacity and will supply stock for four to six pulpers.

Bauer pulpers are equipped with plates which give a refining action and can be adjusted so that one pass through them will produce a correctly refined stock. After sizing, the stock without further refining goes onto the forming machine.

Wide Variety of Uses

The Bauer is extremely flexible and can therefore be used on a wide variety of stock with entirely satisfactory results. Its flexibility is due not to one or two adjustments but results from six controlled variables which are as follows:

1—SPEED. The motors which supply the power are mounted on the same shaft which carries the disc, the speed may vary from 720 RPM to 1,800 RPM, depending upon the desired refining action on the particular stock involved.

2—TYPE OF PLATES. A wide variety of plates is available. Extremely slow stock to very free stock can be produced according to the type of plate selected. The plates are made of a special wear-resisting alloy.

3—SPACE BETWEEN THE PLATES. The space between the plates is controllable by a temper screw which is graduated in thousands per inch. The closer the plates are set together, the greater is the refining action.

4—SHOWER WATER. Three shower pipes are placed in the stock passage between the feeder and the opening in the disc. Freeness of the stock varies with the amount of shower water added; as the shower water is increased the stock becomes freer.

5—TEMPERATURE OF SHOWER WATER. The temperature of the shower water has a pronounced effect on the freeness of the stock. As the temperature rises, the freeness of the stock increases.

6—CONSISTENCY OF STOCK. The freeness of the stock may also be controlled by regulation of consistency as the stock enters the Bauer. Thick stock will be more refined than stock of low consistency.

It can readily be seen that with six means of controlling the refining action the Bauer can successfully be applied to a wide variety of materials, ranging from news to insulation board.

Preliminary Laboratory Tests

In practice, the speed and type of plates are determined by preliminary tests in the Bauer Pulp Laboratory. This laboratory was equipped with three rotary digesters, four Bauers, a decker, three screens, two forming machines, a drier, and laboratory apparatus in general which enables a client to determine on a commercial scale the type of product which can be produced from his material. These laboratory machines differ from commercial machines only in width, for example, the forming machines produce a board two feet wide. The laboratory is adequately equipped with tanks, conveying systems, and pumps so that it can be continuously operated for as long a period as desired. Hence, determinations made in the laboratory will check closely with operating results obtained in commercial mills.

Consistency of the Stock

The consistency of the stock and the amount and temperature of shower water are finally determined after the Bauer is installed, after which the only adjustment for an operator to make is to adjust the space between the plates, which is easily controlled by means of the adjusting screw previously mentioned.

Mechanical and Processing Patents

For the benefit of Bauer users the company has both mechanical and processing patents in the United States and nearly all foreign countries. Because of the nature of the business the Bauer Brothers Company of Springfield, Ohio, does not seek customers but clients.

Roll Handling Truck Stacks 15 Ft. High

When the Gibraltar Corrugated Paper Company, North Bergen, N. J., erected a new roll storage warehouse, a careful study was made of all the available types of roll handling equipment, particularly from the standpoint of maximum utilization of headroom.

Overhead hoists, cranes, and monorails all had their advantages but all had the great disadvantage of reducing the headroom so an electric roll handling truck, designed according to the recommendations of the engineers of the Baker-Raulang Company, Cleveland, was decided upon. This truck, shown in the accompanying photograph, is believed to be the largest truck of its type ever built, having a lift in the clear of 180 inches, an overall height of 255 inches, and the capacity to handle rolls up to 4,000 lbs. in weight and 55 inches in diameter.

During the transfer of stock from the old warehouse, the truck picked up, transported, and stacked 350 rolls in one day from 7:30 A.M. to 9 P.M., a performance of which the management states, "we would not have thought possible." During a subsequent check of one day's routine operation from 7:30 A.M. to 10:30 P.M., the truck received 174 rolls and stacked them five-high, and delivered 88 rolls to production, a total of 262 rolls handled. Time studies show the following:

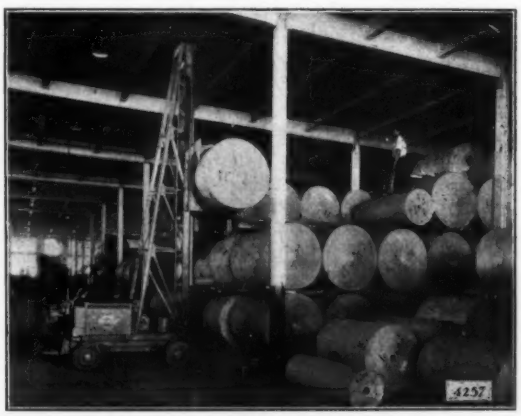
To lift roll from floor and stack 15 feet high, 40 seconds.

To take roll from top tier, back out truck, lower roll, and deliver to elevator 150 feet away, 60 seconds.

To pick up roll from floor and deliver to elevator 200 feet away, 45 seconds.

Floor area of the warehouse is approximately 120 by 230 feet and the ability to stack rolls to the ceiling by means of this truck has increased the available storage space approximately 20 per cent over that permitted by conventional types of roll handling equipment. Maintenance expense has been exceedingly small and the only operating expenses have been for greasing and battery charging which are done nightly without interfering with the use of the truck.

It is estimated that the savings effected by the installation of this truck such as increased storage space, reduction of delivery time on the rolls, and reduction of injuries to personnel, have enabled the company to write off the entire cost of the truck and auxiliary equipment in somewhat less than nine months.



GIBRALTAR CORRUGATED PAPER CO.

The tallest industrial truck ever built handles 4,000-pound rolls of paper 55 inches in diameter and stacks them 15 feet high. The company estimates that the savings shown in the faster and safer delivery of stock and in the increase in storage space by using this truck will enable it to write off the entire cost in approximately 9 months.

Stock Control Apparatus

By Geo. W. Dodge[1]

Automatic continuous and accurate stock regulation and metering is recognized as fundamental to uniform production of quality papers. When these requirements are specified for large production tonnage, it introduces a factor which demands regulation of a precision character which regulation must be maintained within minimum ranges over extended periods without the usual check-up and supervision on the part of control department personnel to supply a necessary correction factor.

Requirements of Apparatus

Any apparatus which is offered for this purpose should not be subjected to the erosive, corrosive or contaminating influences of the stock in which it is working, and be of such design that continuous 24-hour service will not produce wear and tear to the mechanism comprising its structure and introduce non-corrective accumulative errors.

The regulating device should also have sufficient flexibility to take care of a large variation in stock characteristics and tonnages, and where indisputable figures, either for departmental cost, stock percentages, or chemical control are necessary, a dependable, accurate and proven device is available to meet any reasonable exacting demand required.

The above principles and performances have been developed and cleverly incorporated into the Precision Regulator and the Precision Regulating and Metering device, which is illustrated and described herewith. When regulation of stock is required, the best regulation possible tends to eliminate errors in control.

Regulator as Customarily Installed

Figure 2 shows the regulator as customarily installed, using white water for the dilutant. The white water valve (a) is of special design using an adaptation of the V-notch principle as a basis, thereby giving a wide range of capacity with moderate change in port area. This valve is actuated by the regulating mechanism (b) which is a development based on torque variation as applied to the "finder" (c) by the stock in which the finder is immersed and revolves. As the consistency of the stock varies, the tortional resistance of the finder increases or decreases and through a system of differential gears and actuating pawls, the change is communicated to the valve stem of white water valve (a) opening or closing this valve as these variations occur, and provided the necessary supply of white water dilutant to the stock.

The admixture of white water and thorough blending of this white water to the stock is very important and a highly efficient and special type of agitation is provided in the mixing unit marked (d), which unit also provides for a reduction in velocity of the stock at this point and allows time to thoroughly admix the white water with the stock.

The finder is opening under a constant resistance supplied in known variable quantities according as the predetermined density of the stock is changed and any varia-

[1] Chief Engineer, Paper and Industrial Appliances, Inc., New York, N. Y.

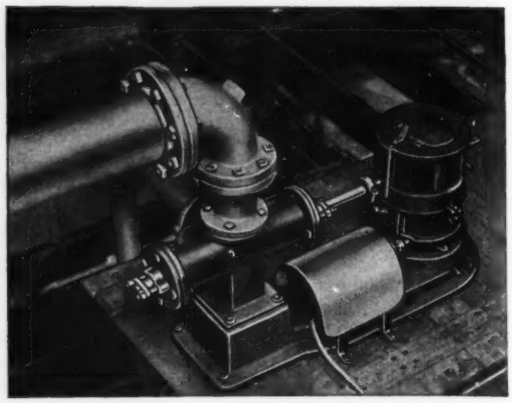


FIG. 1.
Typical installation of a P. & I. consistency control.

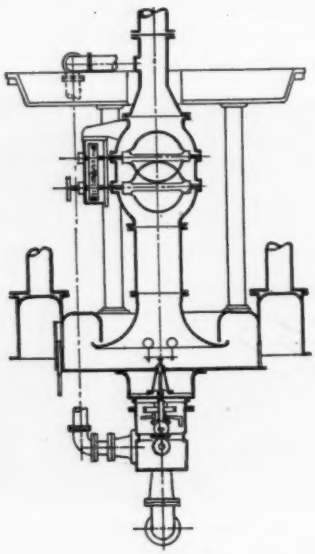


FIG. 2.
Sectional view showing principle of operation of P. & I. consistency control.

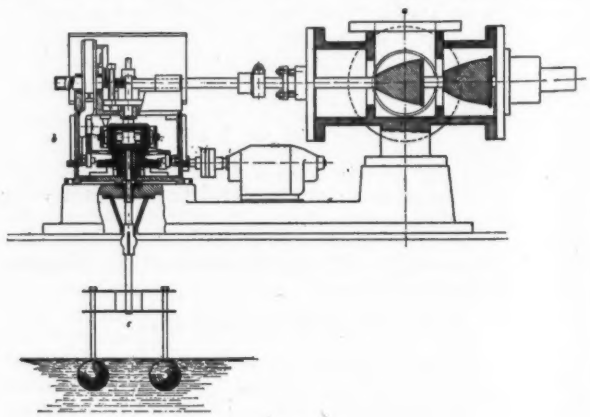


FIG. 3.
Cross section precision consistency regulator and double ported makeup valve.

tion from the predetermined consistency is then regulated by the pawl action in the regulator.

It is essential that the finder be in a medium of regularly changing stock which is in a quiescent state, and this condition is developed by means of the flared standpipe which provides decreasing vertical and lateral velocity to the stock being regulated at this point.

It is to be noted that this regulator is so designed and installed that it regulates on the total flow of stock and not upon a proportionate part, thereby eliminating errors due to this factor.

A connection is provided and apparatus can be supplied which will allow to admixing proportionate material, chemical or color which proportionate admixture is controlled by the volumetric flow through the metering device. This then provides a means of blending and proportioning several stocks, fillers, or clays into one common flow system without the necessity of large tanks and individual mixing chambers, with the attendant duplication of equipment tanks and control apparatus, which may produce undesirable operating conditions such as foaming, slime, air entrainment and maintenance, any or a combination of which reflect in the accuracy of the records and operation.

All mechanical parts are operating in bath of lubricant, and no part of the apparatus, except the finder, comes in contact with the stock.

Regulating and Metering

The metering device is so desgned that accurate measurements of constant regulated stock as it is delivered from the regulator, is recorded as it is discharged from the meter to the chest or stock line.

The arrangement is such that only full measurements are recorded. All measured stock has been freed of entrained air, thus giving the most accurate measurements both volumetric and by regulated density.

The general flexibility of the apparatus is sufficient to provide regulation and measurement over a range of 3 to 1, thereby providing adequate capacities for general fluctuations in demand.

All parts coming in contact with stock are smooth and have large rounded corners, and fillets, and of non-corrosive metal.

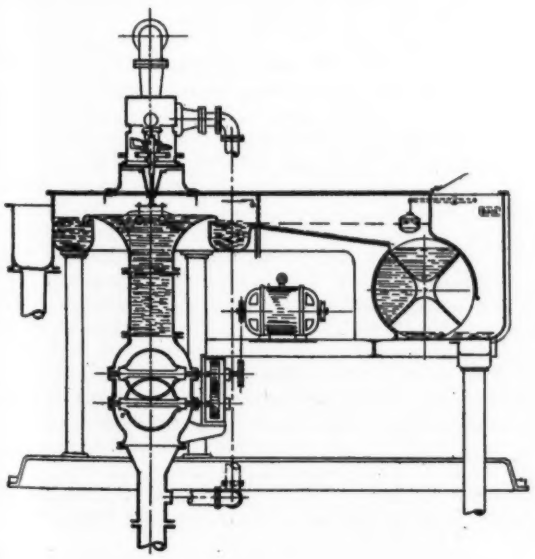


FIG. 4.
Section view showing principle of operation of P. & I. metering device.

The general design is such as will give continuous service with minimum attention and maintenance.

The metering wheel is divided into four equal compartments, each graduated to hold a specific volume. The recording device is actuated by the float which is controlled by the stock flow into the changing compartment, and only records when a compartment is entirely filled, thereby raising the general stock level sufficient to operate the recorded. The metering wheel is so constructed that no leakage is possible which might affect the reading on the recording meter, thereby assuring an overall accuracy of the record.

De-Inking System Improved

One of the new equipments of current interest to many paper makers is the Snyder Maclaren de-inking system as offered by the De-Inking Supply Corporation, of Chicago and New York.

This system is claimed to be the only successful means of de-inking ground wood papers as well as free stock; it has been improved in process so it will operate with water of any degree of hardness as well as at high density, with substantial reductions in chemical and steam costs.

Due to its small space requirements, low cost to install, since it employs only standard paper mill machinery, and its ability to de-ink any kind of paper, it is viewed as one of the outstanding contributions to the paper industry in recent years. It offers not only economies to mills who already de-ink, but by making it practical, permits many others to enjoy the lower costs and other advantages possible from de-inked pulp.

The Snyder Maclaren system employs selective wetting, without the use of cooking or harsh chemicals, which puts the ink in condition to be easily washed from the fibers, making it possible, it is claimed, to recover better pulp from any given furnish of printed papers than by other systems of recovery.

Due to the depletion of domestic supplies of pulpwood it becomes increasingly important nationally that we utilize as much of this potentially good pulp in the manufacture of quality papers as possible, and this additional means of accomplishing economy in manufacture and conservation is receiving gratifying response from the industry.

Successful operations can be demonstrated and an inquiry to De-Inking Supply Corporation, at either 122 East 42nd street, New York, or 400 West Madison street, Chicago, Ill., will bring full information.

Japanese Tariff Affects B. C. Pulp Market

[FROM OUR REGULAR CORRESPONDENT]

VANCOUVER, B. C., October 26, 1935—Imposition of the Japanese embargo, or prohibitive tariff on Canadian products, has taken away the market for about one third of the pulp production of British Columbia Pulp and Paper Company at Vancouver, according to Lawrence Killam, president and general manager. Immediately following this action by Japan the company's plant at Woodfibre was closed down for six weeks. Mr. Killam explains that while this action was contemplated for the purpose of making essential changes and repairs in equipment and machinery, it also enabled the company to adjust itself to changing market conditions as result of elimination of the Japanese outlet.

The Woodfibre plant of the company resumed production on a full time schedule on October 21 when 300 men went back to work. The company's plant at Port Alice continued steady operations.

The Dresden Paper Mills Co. Remodels and Makes Improvements to Power Plant

The Dresden Paper Mills Company, located at Dresden, Ohio, are remodeling their power plant at an estimated expenditure of $100,000.00. The work is in charge of the company's consulting engineers, A. M. Kinney, Inc., of Cincinnati, Ohio.

The present mill is devoted exclusively to the manufacture of nine point strawboard. The old power plant comprised three 250 hp. water tube boilers equipped with natural draft chain grate stokers and operating at 125 pounds steam pressure. Two constant speed lineshafts, each driven by a Corliss engine, and a variable speed shaft, driven by a two cylinder, horizontal, slide valve, variable speed engine, supplied power for the entire mill. Lights and several small motors on the deep well pumps, coal conveyors, etc., were supplied with direct current at 115 volts from a 50 KW generator belted to a lineshaft.

New Boiler Unit Recommended

After a thorough study of the plant the engineers recommended the installation of a new boiler unit, having a capacity of 45,000 pounds of steam per hour and designed to operate at 325 pounds steam pressure. The plan also called for the provision of a 750 horsepower steam turbine to replace the two Corliss engines driving the constant speed shafts. A rearrangement of the old belt drives from the lineshafts to the stuff pumps, Jordans, agitators, and beaters was suggested, which eliminated one line-shaft completely and permitted a direct connection from the new turbine to the two Miami Jordans.

To effect a proper heat balance in the plant, the engineers advised that the new turbine be designed to receive steam at 325 pounds gauge pressure, superheated 100 degrees Fahrenheit, and to exhaust it at 25 pounds pressure for use in the rotary cookers.

Increase in Electric Generating Capacity

The motorization of a new small beater for broken stock and the installation of an individual variable speed motor drive on the paper machine winder, called for an increase in electric generating capacity. To meet this demand a 150 KW D. C. generator, driven from the new turbine, was recommended.

The mill is so situated that low grade coals which are mined in the vicinity can be trucked to the plant for a very low cost. Although the engineers felt that this fuel could best be burned in pulverized form, the heavier auxiliary power requirements involved with such a system precluded its adoption. In the final analysis, multiple retort underfeed stokers were given the preference.

Four Drum Stirling Boiler

The contracts as finally awarded, called for the installation of a Babcock & Wilcox Company's 645 hp., four drum Stirling boiler, with a water cooled bridge wall armored with Bailey blocks. The steam superheater is to be supplied by the Superheater Company; boiler baffling by the Engineer Company; and the boiler setting, which is to be of Detrick steel suspended refractory construction, will be built by the McCabe Construction Company of Cincinnati, Ohio.

The stoker will be a Westinghouse five retort, continuous ash discharge link grate type machine, with built-in turbine drive. The grate area of this equipment has been selected so as to limit the fuel burning rate to approximately 30 pounds per square foot of surface, under maximum load conditions.

The turbine contract was awarded to the DeLaval Steam Turbine Corporation, and specifies a 3600 R.P.M. multistage machine, with a 4.5:1 ratio reduction gear and with an oil relay type governor.

Terry Auxiliary Drive Turbines

All small auxiliary drive turbines will be made by the Terry Steam Turbine Corporation. Boiler feed pumps have been purchased from the Manistee Iron Works Company.

It is expected that the new plant will be in operation some time in November.

Misco Centricast Pipe and Tubing

Among the developments of the past year most interesting to sulphite pulp engineers is the announcement of Misco Centricast pipe and tubing made possible by means of the centrifugal casting process of the Michigan Steel Casting Company, of Detroit, Mich. This is available in any of the popular Misco Alloys of which Misco "C" is the most familiar to the sulphite mills.

Misco Centricast pipe is made in both flanged and screwed types, in sizes ranging from 2 inches to 19½ inches O.D. in lengths up to 36 feet which is the longest that can be conveniently shipped. Flanged ends are of the Van Stone type permitting the use of carbon steel bolting flanges resulting in lower cost, particularly in the case of short lengths. Flanges are drilled in accordance with either the 125 lbs. or 250 lbs. American cast iron standard as may be required.

The company states that "the ability to cast centrifugally pipes of about one-half the wall thickness practicable by ordinary methods of casting makes it possible to utilize the superior physical characteristics of the alloy to a greater advantage. Having an ultimate strength of approximately 95,000 lbs. per square inch and a yield point averaging 63,000 lbs. per square inch, the metal has an elongation of 25 per cent with an area reduction of 33 per cent. Although the thickness of a pipe may be governed by pressure and stress which it receives in service, the thinness has been limited heretofore by practical foundry limitations which determine the minimum wall section possible in static pouring. The trade has therefore experienced for some years the anomaly of high strength material operating at a relatively low stress because it has been possible to better dimensional conditions in practice. With Centricast tubes there is no need to be limited to cast iron and bronze proportions. Modern as the metal with which it is synonymous, the Centricast process makes it possible to design piping installations for maximum efficiency with the complete assurance that design specifications will be realized in practice."

"Engineers who have adopted this equipment consider as distinct advantages the superior strength, greater safety and minimum amount of welded joint."

Pacific TAPPI Meets at Seattle

The Pacific Section of the Technical Association of the Pulp and Paper Industry met at the New Washington Hotel, Seattle, Wash. October 25 and 26, 1935. Myron W. Black of the Inland Empire Paper Company, Spokane, Wash., presided as Chairman. E. G. Thompson of the Great Western Electrochemical Company, was general Chairman of the convention committee.

Plans of the Technical Association

R. G. Macdonald, national secretary was present, and outlined the future plans of the Technical Association, describing in detail the plans of educational cooperation, preparation of monographs and other publications.

Moving pictures of the Institute of Paper Chemistry buildings and equipment were shown by John Strange of that institution. Mr. Strange also showed moving pictures of the effect of chemicals and beating on pulp fibers.

Prof. H. K. Benson of the University of Washington reported the summaries of the papers on cellulose that were presented at the American Chemical Society meeting at San Francisco.

John Strange of the Institute of Paper Chemistry, Appleton, Wis. reported on the progress being made by the grading committees of the various trade associations.

At the luncheon Lt. Col. Abbott Boone of the Fourth Reserve District talked on "What the United States May Expect from the Italo-Ethiopian Situation."

Following luncheon G. H. McGregor of the Weyerhaeuser Timber Company, Pulp Division, talked on "The Relations Between the Physical and Chemical Constants of Pulp." Among other things Dr. McGregor pointed out that the degradation of pulp is accelerated most by heat, next by bleach, and last by acid.

Carl Fahlstrom of the Longview Fibre Company described the use of the permanganate number test for controlling the quality of sulphate pulp.

During the banquet R. G. Macdonald was again one of the speakers and discussed the method of operation of the Technical Association Division organization.

Cassius E. Gates of the Seattle Chamber of Commerce was the principal speaker and talked on "Some Phases of the New Deal."

On Saturday morning Kenneth Shibley of the Shibley Company, described some of the new filter plants in the Pacific Northwest and Paul F. Bovard of San Francisco added comments to his presentation. Mr. Shibley pointed out that about 80 per cent of the work in a filter plant should be done before the water reaches the filters.

W. E. Buchanan of the Appleton Wire Works, Appleton, Wis. discussed fourdrinier wires and presented a number of present day problems.

H. K. Benson, R. B. Colby and M. D. Schmid read a paper on "Pulping of Age Rings of Douglas Fir" and Frank McLeod of the University of Washington talked on the "Bleaching of Douglas Fir." Experiments show that Douglas fir can be bleached.

H. A. Erikson of the Svenska Flaktfabriker, Stockholm, Sweden, described the method of drying pulp with air in Swedish mills.

Election of Officers

The nominating Committee consisting of R. S. Wertheimer, I. H. Andrews and A. S. Quinn presented the following slate which was elected by acclamation:

Chairman, W. R. Barber, Crown Willamette Paper Company, Camas, Washington; Vice Chairman, Carl Fahlstrom, Longview Fibre Company, Longview, Wash.; Secretary-Treasurer, E. G. Thompson, Great Western Electrochemical Company, Seattle, Wash. Executive Committeemen: Andreas Christensen, British Colombia Pulp & Paper Company, Vancouver, B. C. By vote, it was decided to abolish the office of second vice chairman.

Those Who Attended

Those present included: G. F. Alcorn, Weyerhaeuser Timber Company, Longview, Wash.; G. J. Armbruster, Puget Sound Pulp and Timber Company, Everett, Wash.; W. M. Bain, Crown Willamette Paper Company, Camas; T. J. Bannon, Western Gear Works, Seattle; W. R. Barber, Crown Willamette Paper Company, Camas; H. K. Benson, University of Washington, Seattle; M. W. Black, Inland, Empire Paper Company, Spokane, Wash.; C. E. Braun, Hawley Pulp and Paper Company, Oregon City, Ore.; G. S. Brazeau, Weyerhaeuser Timber Co., Everett; W. E. Breitenbach, Grays Harbor Pulp and Paper Company, Hoquiam, Wash.; J. M. Carlson, Soundview Pulp Company, Everett; R. E. Chase, Tocoma, Wash.; E. F. Clark, L. H. Butcher Company, Seattle, Wash.; W. W. Clark, Longview Fibre Company, Longview; S. M. Collier, Soundview Pulp Co.; N. W. Coster, same company; J. V. B. Cox, Paper Makers Chemical Corporation, Portland; H. A. Des Marais, General Dyestuff Corporation, Portland; E. G. Drew, J. O. Ross Engineering Corporation, Portland; D. E. Dupuis, Crown Willamette Paper Company, Lebanon, Ore.; E. Ekholm, Puget Sound Pulp and Timber Company, Bellingham, Wash.; R. C. Erchinger, Doran Company, Seattle; J. P. V. Fagan, Puget Sound Pulp and Timber Company, Anacortes, Wash.; Carl Fahlstrom, Longview Fibre Company, Longview, Wash.; Leo Friedman, Oregon State College, Corvallis; M. H. Friedman, Columbia Steel Company, Seattle; L. T. Graham, Link Belt Company, Seattle; K. B. Hall, Improved Paper Machinery Company, Portland; J. E. Hassler, Simonds Worden White, Portland; R. S. Hatch, Weyerhaeuser Timber Company, Longview; H. R. Heuer, same company; A. H. Hooker Jr., Hooker Electrochemical Company, Tacoma, Wash.; G. D. Humphrey, British Columbia Pulp and Paper Company, Vancouver, B. C.; E. R. Johnson, Longview, Wash.; W. D. Jorres, L. H. Butcher Company, Portland; W. N. Kelly, Weyerhaeuser Timber Company, Longview; P. B. Keyes, Goodyear Rubber and Asbestos Co.; Portland; Lawrence Killam, British Columbia Pulp and Paper Company, Vancouver, B. C.; M. E. Kinsey, Rainier Pulp and Paper Company, Shelton, Wash.; E. C. Lathrop, J. C. Long, Crown Willamette Paper Company, Camas.

D. J. MacLaurin, British Columbia Pulp and Paper Company, Woodfibre, B. C.; A. M. Mears, Pacific Coast Supply Company, Portland; Ned Menzies, W. S. Tyler Company, Seattle; G. F. Mitchell, Hesse-Ersted Iron Works, Portland; T. E. Moffitt, Hooker Electrochemical Company, Tacoma; C. W. Morden Machines Company, Portland; Peter Parent, Tacoma, Wash.; R. T. Petrie, Bagley & Sewall, Portland; A. S. Quinn, Stebbins Engineering and Manufacturing Company, Seattle; J. G. Ramsey, Everett Pulp and Paper Company, Everett; J. G. Richards, Van Waters & Rogers, Portland; Percy Sandwell, Vancouver, B. C.; M. E. Sanford, Fibreboard Products Inc., Sumner, Wash.; B. W. Sawyer, Foxboro Company, Portland; Harlan Scott, Pacific Pulp and Paper Industry, Seattle; F. C. Shaneman, Pennsylvania Salt Company, Tacoma; J. M. Shedd, Everett Pulp and Paper Company, Everett; B. L. Shera, Tacoma Electrochemical

Company, Tacoma; K. Shibley, Shibley Company, Seattle; L. K. Smith, Pacific Pulp and Paper Industry, Seattle; E. G. Thompson, Great Western Electrochemical Company, Seattle.

W. C. Williams, R. B. Wolf, Weyerhaeuser Timber Company, Longview, Wash; Arthur Zimmerman, Pacific Straw Paper Company, Longview; C. H. Belvin; R. G. Macdonald, TAPPI, New York; W. S. Hodges, Portland; G. E. Schmidt, L. H. Wear, George Douglas, Howard Graham, G. H. McGregor, Weyerhaeuser Timber Company, Longview; H. A. Erikson, Swedish Fair Company, Stockholm, Sweden; John Strange, Institute of Paper Chemistry, Appleton, Wis; W. E. Buchanan, Appleton Wire Works, Appleton; W. A. Kagl, J. W. Martin, L. R. Benjamin, Derwent Valley Paper Company, Tasmania, Australia; D. K. McBain, Martin Bruer, E. I. duPont de Nemours & Co., San Francisco, Cal.; B. Rauschert, R. E. Bundy, N. Hartnagle, K. G. Hill, C. M. Carmichael, R. N. Hammond, Weyerhaeuser Timber Company, Longview; Irving Angrove, Winston Scott, Lawrence Supove, G. F. Winklesky, O. C. Schoenwerk, W. A. Bain, H. R. Simonds, R. V. Bingham, B. F. Kearns, E. H. Barton, H. A. Lohman, P. F. Bovard, San Francisco, Cal.; Cecil Triplett, Ray Janz, H. Schermerhorn.

Paper Business Active In Boston

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, MASS., October 28, 1935—The paper market continued active in Boston during the week, although the latter part of the month has not been productive of as much volume in sales as the first part. A few, however, note a better market. An executive at one office said that business was very good on both white and wrapping paper. He commented, "Everybody is happy and that is a good sign." That business is distinctly better, as a whole, than it was a year ago at this time is generally conceded.

Increase in the sale of fine papers of a better grade has developed. There is a definite tendency on the part of the buyer to use higher grades, which applies not only to bond papers, but also to those used for general advertising purposes.

The demand for wrapping paper has been sustained throughout the month, so far, fairly well. At one office it was noted that the market seems to be improving generally.

The box board market is progressing on the even tenor of its way, above the August and September levels. The call for boards is at least fair.

Paper stock continued steady, by and large, with prices strong. In old papers, dealers were able to sell all the mixed papers and old newspapers they could buy, although prices were recently marked down. It is felt that these grades are not coming in as fast as they were, on account of the low prices. Prices of old papers were unchanged.

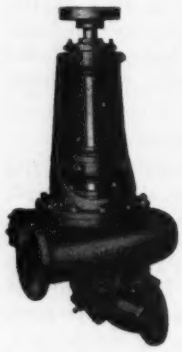
Bagging was very active. Domestic gunny No. 1 advanced to 1.65 from 1.50, domestic scrap burlap to a range of 1.60@1.75 from a flat 1.60, scrap sisal to 1.50@1.60 from 1.30@1.35, scrap sisal for shredding to 1.60@1.75 from 1.35@1.50 and heavy baling bagging to 2.00@2.25 from 1.75@2.00.

New and old domestic rags continued strong at the same levels, with foreign rags moving in about the same volume at unaltered prices.

The demand for cotton twines of all kinds is reaching the supply line. Finished jute twines have advanced in price.

A New Pump for Pulpy Materials

A non-clogging pump for handling sewage or pulpy materials at high speeds and against high heads, has been developed by Morris Machine Works, who are the oldest American manufacturers of centrifugal pumps and have long specialized in building pumps for abrasive and pulpy mixtures. This new design permits the use of standard high-speed motors which are more compact and less expensive than the lower speed motors required for older types of sewage and pulp pumps.



The unit is completely self-contained, with heavy duty double ball radial and thrust bearings supported on a substantial extension of the hub disc so that both bearings are maintained in perfect alignment with the pump body. A special advantage of this construction is that when installing the pump, the bearings will not require lining-up or adjusting.

An exclusive feature is the floating suction ring which is designed so that solid particles will not interfere with its effectiveness as a seal between the suction and pressure parts of the pump. The shaft is exceptionally heavy, and the impeller of each size will pass solids up to 1 in. smaller size than the pump outlet. Efficiencies above 85 per cent have been obtained in several installations.

The design supplements the previously developed lines of Morris Non-clogging Pumps for lower speeds and Morris Axial Flow and Screw Pumps for large capacities at low heads and high speeds. The new units are built both vertical and horizontal, in sizes from 3 to 10 in., with open or enclosed impellers. Further information can be obtained by addressing Morris Machine Works, Baldwinsville, N. Y.

Ask Customs Court To Override Action

Importations of various papers from Canada, claimed by the importers to be duty free as standard newsprint have been held by Customs officials at various border ports to be dutiable as printing paper at ¼ cent per pound and 10 percent, and the importers have asked the United States Customs Court to overrule this action. The Import Committee is preparing to assist the Government in defense of the action of the Customs officials when the cases come to trial.

Among the papers involved in these cases are four kinds of paper, all sold at prices materially higher than the usual prices for standard newsprint. One grade, for instance, is being sold at $85 per ton delivered and some of the paper is No. 2 poster in bright shades in sheets, sold delivered at $52, including freight of $8.70 per ton. At Houston a shipment of canary writing is being claimed to be standard newsprint, but has been classified for duty as printing paper.

The need for constant scrutiny of importations of foreign merchandise is shown by the manner in which importers of greaseproof paper are endeavoring to take advantage of the reduction in the rate of duty on vegetable parchment paper put into effect by the Belgian reciprocal trade agreement. A high grade German greaseproof paper is claimed by the importers to be dutiable at the new low rate of 2 cents per pound and 10 percent for vegetable parchment paper, instead of the proper rate of 3 cents per pound and 15 percent provided for greaseproof paper.

Government Paper Bids and Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., October 30, 1935—The Government Printing Office has announced the following paper awards:

The Old Dominion Paper Company will furnish 34,880 pounds (80,000 sheets) of 32x42 high finish sulphite manila tag board at 5.45 cents per pound. The Paper Corporation of the United States will furnish 33,900 pounds (150,000 sheets) of 24½x32½ white single ply sulphite index at 6.06 cents per pound. Bids for both of these items were received on October 14.

The Whitaker Paper Company will furnish 18,900 pounds (150,000 sheets) of 50 per cent rag 31x38 white bond paper at 11.591 cents per pound. The same firm will also furnish 15,075 pounds (150,000 sheets) of 21x32 50 per cent rag white ledger paper at 12.63 cents per pound and 5,000 pounds (38,000 sheets) of 21x32, 50 per cent rag buff ledger paper at 13.44 cents per pound. Walker Goulard Plehn Company will furnish 39,500 pounds (164,000 sheets) of 50 per cent rag yellow and buff index paper at 11.366 cents per pound. Bids for all of these items were received on October 11.

John F. Post will furnish 69,000 pounds (600,000 sheets) of 32x42 green sulphite writing paper at 6.29 cents per pound and the R. P. Andrews Paper Company will furnish 5,000 pounds (25,000 sheets) of 19x24 blue desk blotting paper at 7.76 cents per pound. Bids for these items were received on October 9.

The R. P. Andrews Paper Company will furnish 260 sheets of white cloth centered paper at $16.50 per hundred sheets and the same firm will also furnish 15 pounds (100 sheets) of 100 per cent rag waterproof ledger paper at 72 cents per pound. Bids for these items were received on October 4.

The following paper awards have also been announced:

Barton, Duer & Koch Paper Company has been awarded the contract for furnishing 2,000 pounds (12,500 sheets) of 25x38, 100 per cent rag antique finish book paper at 24 cents per pound. The R. P. Andrews Paper Company will furnish 6,000 pounds (30,000 sheets) of 19x24 buff desk blotting paper at 7.76 cents per pound. The same firm will also furnish 33,400 pounds (400,000 sheets) of 25 per cent rag pink bond paper at 10.7185 cents per pound. Barton, Duer & Koch Paper Company will furnish 23,000 pounds (100,000 sheets) of 50 per cent rag blue index paper at 11.23 cents per pound and the R. P. Andrews Paper Company will furnish 18,400 pounds of green, pink and yellow same at 11.866 cents per pound. The Whiting Plover Company will furnish 151,650 pounds (1,100,000 sheets) of 50 per cent rag white bond paper at 11.248 cents per pound and the Barton, Duer & Koch Paper Company will furnish 4,890 pounds (30,000 sheets) of 25 per cent rag blue ledger paper at 10.49 cents per pound. Bids for all of these items were received on October 18.

The Whitaker Paper Company will furnish 10,000 pounds (70,000 sheets) of 28x34, 50 per cent rag white ledger paper at 12.48 cents per pound. Reese & Reese, Inc., will furnish 10,000 sheets of 22x28 gray photo mount board at $37.45 per M sheets. The Old Dominion Paper Company will furnish 33,550 pounds (400,000 sheets) of 25 per cent rag colored bond paper at 9.74 cents per pound. The R. P. Andrews Paper Company will furnish 145,770 pounds (1,130,000 sheets) of 31x44 50 per cent rag M. F. book paper at 9.3 cents per pound. The Mathers-Lamm Paper Company will furnish 21,600 pounds (300,000 sheets) of 21x32 pink sulphite writing paper at 6.3 cents per pound. Bids for all of these items were received on October 16.

The Russell Products Company will furnish 2,000 sheets of 25x30 gray stereotype molding paper at 22 cents per pound, bids for which were received on October 9.

The Cauthorne Paper Company will furnish 57,500 pounds (500,000 sheets) of 32x42 pink sulphite writing paper at 6.54 cents per pound. The R. P. Andrews Paper Company will furnish 4,800 pounds (30,000 sheets) of 25 per cent rag salmon blotting paper at 9.7 cents per pound. J. R. Howarth Paper Company will furnish 33,900 pounds (150,000 sheets) of 24½x32½ single ply white sulphite index at $13.69 per M sheets. Bids for all of these items were received on October 4.

The Printing Office has also received the following paper bids on the open market:

The following bids at 6.35 cents per pound were received for 55,120 pounds of single coated book paper from: Whitaker Paper Company, Reese & Reese, Inc.; Virginia Paper Company, Barton, Duer & Koch Paper Company, R. P. Andrews Paper Company, J. W. Butler Paper Company, Paper Corporation of the United States.

Bids were received for 14,350 pounds of 25 per cent rag pink bond paper No. 40 as follows: Whiting Paper Company, 9.749 cents; Reese & Reese, Inc., 9.749 cents; Old Dominion Paper Company, 9.74 cents; Aetna Paper Company, 10.7185 cents; Barton, Duer & Koch Paper Company, 10.7185 cents; Mathers-Lamm Paper Company, 10.7185 cents; Paper Corporation of the United States, 9.749 cents; and R. P. Andrews Paper Company, 9.7 cents

For 19,050 pounds, of 25 per cent rag pink bond paper No. 26 as follows: Whiting Paper Company, 11.906 cents; Reese & Reese, Inc., 11.906 cents; Whitaker Paper Company, 13.09 cents; Old Dominion Paper Company, 12.74 cents; Aetna Paper Company, 13.09 cents; Barton, Duer & Koch Paper Company, 13.09 cents; Mathers-Lamm Paper Company, 10.7185 cents; Paper Corporation of the United States, 11.906 cents; and R. P. Andrews Paper Company, 11.5 cents.

For 2,000 pounds of white wove antique paper: R. P. Andrews Paper Company, 27 cents per pound and Barton, Duer & Koch Paper Company, 24 cents.

For 6,000 pounds of buff desk blotting paper at 7.76 cents per pound as follows: R. P. Andrews Paper Company, Enterprise Paper Company, Whitaker Paper Company, Old Dominion Paper Company, Graham Paper Company, Barton, Duer & Koch Paper Company, and Virginia Paper Company.

Herbert C. Robbe Dead

PROVIDENCE, R. I., October 28, 1935—Herbert C. Robbe, 54 years old, executive of the Providence Paper Company here, died at a Nashua, N. H., Hospital Wednesday, following a short illness. Mr. Robbe was born in Nashua, January 6, 1881, a son of the late Charles A. Robbe and H. Maria Robbe. He was graduated from Peterborough High School and Cushing Academy. He had been a resident of Nashua the last eighteen years, but for 33 years had been employed in Providence.

Mr. Robbe was a member of St. John's Lodge of Masons of Providence, Rhode Island Consistory, Mystic Shrine, and Westminster Lodge of Odd Fellows of Providence, and of the Unitarian Church of Nashua.

A son, Donald C. Robbe, and his mother, Mrs. H. Maria Robbe, of Nashua, are living.

Great Lakes Deal Protested

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, ONT., October 28, 1935—Strong protest against proposed sale of the Great Lakes Pulp and Paper Comany's output to United States interests, headed by the *Chicago Daily News*, were voiced last week by representatives of the Canadian Newsprint Manufacturers' Association, who told a special sub-committee of the Ontario Cabinet in Toronto that the deal would lead to a price war and tend to ruin Canada's paper industry. The deputation, comprising Charles Vining, association president; A. R. Graustein and the Hon. J. L. Ralston, spent several hours laying their case before Premier Hepburn; Provincial Secretary Harry Nixon; Peter Heenan, Lands and Forests Minister, and Labor Welfare Minister David Croll. Since the cabinet committee has not yet heard arguments of the company bondholders and representatives of the United States, it merely listened to the deputation without giving any answer to the request that the proposed deal be dropped.

While the province has no direct control over Great Lakes Pulp and Paper Company, which is now operating under a receivership, it is possible to dictate the terms of any deal since it owns the 7,000 to 9,000 square miles of timber limits on which the company operates. These vast timber possessions in the Black Sturgeon, Pick River and Long Lac areas around Fort William constitute the most extensive timber limits held by any company in Ontario. In brief the group of United States publishing firms proposes to buy at the market price some 50,000 tons of paper annually, which is about 30,000 tons more than the Great Lakes Pulp and Paper Company now sells. The deal would involve no purchase of the company's physical assets and Canadian newsprint manufacturers contend that the United States group, having no investment in Canada, would be concerned solely in obtaining newsprint as cheaply as possible. The effect of the deal, they say, would be to divert business from other Canadian companies, leading to drastic price-cutting to the general detriment of the industry.

On the basis of the increased output of the Great Lakes Company's plant, the province would stand to make an additional $100,000 annually in stumpage dues, but if the contentions of Canadian manufacturers are correct, this would be offset by revenue losses resulting from the decreased demand for the products of other Canadian companies. The committee, it is understood, will hear all sides and make a careful analysis of the situation to determine what the exact effect of the deal would be before giving it the official O. K. So far neither the company's bondholders nor representatives of the United States group have conferred with the Ontario Government, nor have they yet asked for an appointment, but it is expected that the cabinet sub-committee will discuss the proposed deal with them in the near future.

New Oil-Proof V-Belt

The first completely Oil-Proof V-Belt ever developed for general industrial use has just been announced by A. L. Freedlander, vice-president and factory manager of the Dayton Rubber Manufacturing Company, Dayton, Ohio. "The new belt will be marketed under the name 'Daycoil'. Its principal field of application will be the machine tool and other industries where excessive oil in connection with power transmission has long been a problem," Mr. Freedlander said.

"The 'Daycoil' V-Belt is an advanced step in chemical and power transmission engineering and was developed over a period of years. The Dayton Rubber Manufacturing Company, has pioneered in the development and marketing of synthetic rubber products. During the past five years the company intensified its efforts in the development of the uses of synthetic rubber and various synthetic resinous materials to take the place of natural rubber where oil and solvents were encountered to an excessive degree. First experiments with synthetic resins were started by the company many years ago.

"Synthetic rubber, however, is a general term and is but one of several synthetic materials used in the construction of the 'Daycoil' casing. Hundreds of compounds along with synthetic rubber were tried over a period of years before 'Daycoil' was developed and accepted as having all of the ideal properties to completely oil-proof a V-Belt. Patent applications have been filed for some time covering this original oil-proof V-Belt development.

"The 'Daycoil' V-Belt carries the same laminated construction principles as the regular Dayton Cog-Belts for general transmission applications, plus, however, the specially designed casing of the new synthetic compound to resist oil.

"Dayco, the oil-proof material used in the construction of 'Daycoil' V-Belts, has all of the properties of natural rubber, such as flexibility, plasticity and resiliency, plus aging properties many times that of rubber, and much greater abrasive and wearing qualities when subjected to oils and solvents.

"The 'Daycoil' Oil-Proof V-Belt was first subjected to the most exhaustive tests in both laboratory and shop.

"After the laboratory and dynamometer tests, actual field tests were made. The applications were various machine tools where a wide range of oily conditions could be encountered in normal plant operation. These exhaustive tests have proved that 'Daycoil' Oil-Proof V-Belts will effect a substantial saving in belt costs in all types of service wherever oil is a factor.

James M. Geraghty Tendered Dinner

[FROM OUR REGULAR CORRESPONDENT]

HOLYOKE, MASS., October 29, 1935—James M. Geraghty for the past eleven years superintendent of the Crocker Division of the American Writing Paper Company, Inc., was tendered a dinner by his associates and executives of the company at the Hotel Nonotuck Thursday night. Mr. Geraghty recently resigned to take a position as manager of the Ticonderoga Division of the International Paper Company.

Robert Pattison acted as toastmaster and Mr. Geraghty was presented by him with a set of silver in behalf of the gathering. Among those present were Lafayette C. Reynolds, comptroller and Assistant to President Sidney L. Willson; Vice President Leon M. Yoerg in charge of the manufacturing department; Vice President Maddent in charge of sales and Treasurer William J. Norton.

Crystal Tissue Co. Reports Profit

The Crystal Tissue Company reports for the nine months ended September 30: Net income after all charges, $30,139, equal after preferred dividend payments to 16 cents a share on 93,000 common shares, compared with $6,268 or 34 cents a common share a year before. Quarter ended September 30: Net income, after all charges, $13,383, or 9 cents a common share, against $4,1456 or $1.66 a share on 2,500 preferred shares in preceding quarter, and $18,436 or 14 cents a common share in third quarter of 1934.

New IMPCO Equipment

During the past year, the Improved Paper Machinery Corporation of Nashua, N. H., has kept pace with the modernization programs of prominent mills throughout the industry by designing and constructing new equipment to meet present-day needs for greater capacity, efficiency and lowered operating cost. Not only has Improved designed and built new types of equipment for the mills, but it made many notable changes in their equipment which has become standard in the mills, in order to provide the character of trouble-free operation so necessary for profitable production.

Among the many new types of equipment designed and built during the past year is the "Impco" Rubber Covered Vacuum Acid Washer. This machine was designed to wash stock from a stage of chlorination before neutralization with consequent savings in cost of caustic or lime. All parts coming in contact with stock or acid water are protected with hard rubber. These machines are equipped with "Impco" vaned roll discharge and conical valve insuring the same positive sheet removal and precise control of vacuum as is obtained on the all metal vacuum washers. Fresh water seals are provided to protect the packing glands from deterioration through the action of the chlorine water or hydrochloric acid. The machine can be furnished with an auxiliary vacuum cylinder which receives a continuous sheet from the washer and by means of press rolls discharges the pulp at a consistency suitable for a high density bleacher.

Ordinarily the pulp discharged from the washer would be diluted from 10 per cent to 1.5 per cent with water and then thickened on a second vacuum filter equipped with press rolls. The vacuum cylinder, in reality a tankless filter, eliminates the vat, thus decreasing the cost of the equipment and at the same time saves a considerable volume of water.

There is a growing demand in the paper trade for rolls, wound to specifications as to hardness, smooth ends, equal tension and true holes when cores are not used. For making these rolls, a collapsible shaft is required. The Improved Paper Machinery Corporation is now building the new "Howe" Collapsible Shaft which provides, when expanded, a continuous perimeter without holes or grooves so that there is no tendency for the sheet to lock itself to the shaft. When the shaft is in the expanded position, two tapered wedges are forced into position which hold the collapsible halves to the full diameter. The construction is such that the shaft is unusually stiff and allows easy removal from the rolls.

One of the most important contributions to the paper industry was the design and construction of the "Impco" Flat Screen. This modern screen embraces the patented Dunbar Drive which, in itself, is an outstanding advance in machine operation. The Dunbar Drive, in addition to being silent and free from vibration, has anti-friction bearings on drive shaft and anti-friction eccentric, as well as removable bronze bush bearings on rocker shaft. It effects substantial savings in power and maintenance costs. Without cams or springs it affords continuous operation without frequent replacements.

To provide even more service and trouble-free operation from these flat screens, the new all metal vat was developed which is available in bronze, cast iron or stainless steel construction. This new metal vat is permanent in character. Special fasteners for beveled type plates are built as an integral part of the vat thus eliminating the objections formerly experienced in wood vats, such as loosening of the fastening mechanism in the wood and unavoidable leakage around the srips sealing the ends of the plates. Due to the greater rigidity of the metal construction over the conventional wood, this screen has shown drastic increases in capacity and at the same time through the use of the Dunbar Drive and considerably reduced the necessity for cleaning of the plates during operation.

The vats of adjacent screens are butted, thus eliminating bridging. The rubber diaphragms may be replaced without lifting of the vat. Without considering reduced maintenance cost and longer life, these screens through their greater capacity have in several instances not only shown lower operating costs but lower first cost per ton of pulp than the conventional design.

Pollution Not Caused by St. Helens

[FROM OUR REGULAR CORRESPONDENT]

PORTLAND, Ore., October 21, 1935 — Wholesale fish deaths in the Willamette river slough which have drawn the ire of the Oregon state game commission, were not caused by chemically polluted water from the plant of St. Helens Pulp and Paper Company, according to Uno Frykland, chief pulp chemist.

Frank B. Wire, Oregon game supervisor, had blamed the St. Helens mill for the destruction of fish and called upon sportsmen to fight for a clean-up of the entire river length in the district. Mr. Wire replied to the St. Helens Mill's declaration that water at its mill's outlet was alkaline, not acid, by admitting that chemicals put into the river by other upstream mills, as well as sewage from Portland and other nearby cities, might be causing the fish deaths.

Analysis of the water is now being made by the Oregon board of health. This report should clear up the point of St. Helens' guilt in the fish-killing controversy.

Partial clearance of the paper and pulp mill was announced in a statement by R. G. Elliott, official of St. Helens Chamber of Commerce. He declared that Uno Frykland, chief chemist of the paper company, had spent a day with Portland investigators making tests of the river water at and above St. Helens.

Mr. Elliott said the party reported that only two steelhead and a dead toule fish were found at any point in the river and these were at the conjunction of Multnomah slough with the river. Another point in the St. Helens Mill's favor was the story of fishermen that the three fish had floated downstream from up-river-way.

Victor Cohen Agent for Elk Paper Mfg. Co.

The Elk Paper Manufacturing Company, of Childs, Md., manufacturers of parchments, W. F. fibers, manilas and sulphite specialties, has appointed Victor Cohen, 36-02 35th avenue, Long Island City, N. Y., as agent in the Metropolitan district. Mr. Cohen also represented in the same area the Munroe Paper Corporation of Lawrence, Mass., and the Consolidated Paper Bag Company, Somerville, Mass.

Walter B. Sheehan Convalescing

Walter B. Sheehan, treasurer of the Missisquoi Corporation, manufacturers of fine card board and specialties, Sheldon Springs, Vt., was operated on in the House of Providence Hospital at Holyoke, Mass., last week. Mr. Sheehan is convalescing very nicely, but it will probably be several weeks before he returns to his duties.

C. H. Leissler, Jr. with Mohawk Paper Mills

The Mohawk Paper Mills, Inc., with plants at Waterford, N. Y. and Cohoes, N. Y., announces that Charles H. Leissler, Jr., has become associated with the organization as assistant to Mr. Keller in the New York offices of the company.

Paper and Pulp Mills Get Safety Plaques

One hundred twenty bronze plaques and 74 framed certificates were awarded at the Twenty-Fourth Annual Safety Congress, October 14-18, at Louisville to winners and runners-up in seven major contests conducted by the National Safety Council.

One hundred ten mills competed in the Paper and Pulp Section Contest this year. These mills employed 42,378 men who worked 86,867,184 man-hours. The average frequency rate was 16,566, a decrease from the average frequency of 19.626 of last year. Sixty-three mills operated with an average frequency below this: twelve mills with perfect records. In this contest twelve plaques were awarded and six certificates, the plaques to the following:

Division I Group A—Hollingsworth & Whitney Company, Algonquin & Taconnet Mill, Waterville, Maine. 2,449,350 hours, 11 injuries.

Group B—St. Croix Paper Company, Woodland, Maine. 785,793 hours, no injuries.

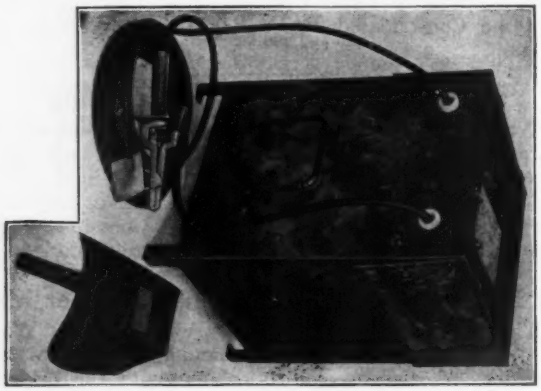
Group C—International Paper Company, Little Island, N. Tonawanda, N. Y., 548,504 hours, 1 injury.

Group D—Five plants tied for first place—Bird & Son, Inc., Phillipsdale, R. I., 216,581 hours, no injuries; United States Envelope Company, Morgan Paper Co. Div., Lititz, Pa., 184,863 hours, no injuries; International Paper Company, Livermore Mill, Chisholm, Maine, 158,610 hours, no injuries; Spaulding Fibre Company, Inc., New Mill Plant, Milton, N. H., 125,879 hours, no injuries; International Paper Company, Riley Mill, Riley, Maine. 116,298 hours, no injuries.

Division II—Four tied for first place—Container Corporation of America, Natick, Mass., 166,846 hours, no injuries; Texas Corrugated Box Company, Dallas, Texas. 141,340 hours, no injuries; Southern Container Company, Houston, Texas, 129,016 hours, no injuries; United States Gypsum Company, Genoa, Ohio, 82,084 hours, no injuries.

Miller Wonder Arc Welders

An A. C. electrical arc welder which quickly and efficiently welds on light weight metals, down to 26 gage steels, with amperage from 15 to 275, is announced by the Miller Electric Manufacturing Company, Inc., Appleton, Wis., which has been manufacturing A. C. welders for the past four years. Known to the trade as Miller's Wonder Arc Welders, they are especially adaptable for use in plants handling light weight steels, anywhere a portable electric welder is required. Recommended for cold welding of cast iron, such as motor blocks, heads and cast iron machinery of all types. With it the operator can weld steel with a breaking point of 75,000 lbs. per square inch.



A. C. ELECTRIC ARC WELDER

The Miller Wonder Arc Welder is complete with welding leads and hand shield, as illustrated here, and is equipped with handles for portable use. Made in three sizes—15 to 150 amperes, which handles 1/16 to 5/32 inch rod; 15 to 275 amperes which handles 1/16 to ¼ inch rod, and the junior welder, 15 to 90 amperes for small power service, these welders have no moving parts, an especially stable arc. They operate on 220 volts, 60 cycle single phase.

The manufacturer claims for these welders very economical operation; that they weld more feet per minute per ampere output, and have an exclusive feature in the directional flow of metal which makes side or overhead welding easy. They are safe and easy to operate. There is no electrical connection between the power output and the welding leads.

To Reopen Orange Paper Mill

ORANGE, Texas, October 28, 1935—According to information coming from New York late Saturday, the deal has been closed whereby the Equitable Paper Bag Company, of Brooklyn, N. Y., of which Maurice Rosenfeld is president, acquires the plant and other properties of the Yellow Pine Paper Mill Company here.

I. Eisenberg and S. D. Krisel, representing the purchasing concern, left here last week on their return to New York headquarters. Before leaving they stated that work of putting the plant in order for operation would be started at an early date. It is planned to start the paper making machines by using pulp purchased from European producers. It is understood that a large cargo of pulp for the mill is probably en route now from Sweden.

In the meantime, it is understood that a rather extensive bag manufacturing and printing plant will be installed in connection with the paper mill in a building adjacent to the mill building previously occupied by the Union Bag and Paper Company. It is understood also that machinery for the bag plant will be shipped immediately from Brooklyn to Orange.

P. H. Moran, who is widely experienced on all grades of paper and boards, has been appointed superintendent. Frederick L. Smith, paper mill engineer, 21 East 40th street, New York, will have charge of reconstructing the mill.

William A. Luke Dead

William A. Luke, former manager of the Covington plant of the West Virginia Pulp and Paper Company, who retired about two years ago, died suddenly in Covington, Va., last week. His father was the late William Luke who, with his sons, established the Luke plant of the company.

He is survived by his widow, Mrs. Otie Owens Luke, formerly of Piedmont; a son, William A. Luke, Jr., and two daughters, Mrs. Percy C. Whitlock and Mrs. Foster Witt. He also leaves two brothers, Thomas L. Luke and Adam K. Luke, of New York, and a sister, Mrs. W. D. Hopkins of Baltimore.

Lagerloef Trading Co. Announces Personnel

The Lagerloef Trading Company, Inc., well known wood pulp agents, 52 Vanderbilt avenue, New York, announces its executive personnel as of October 21, 1935 as follows:

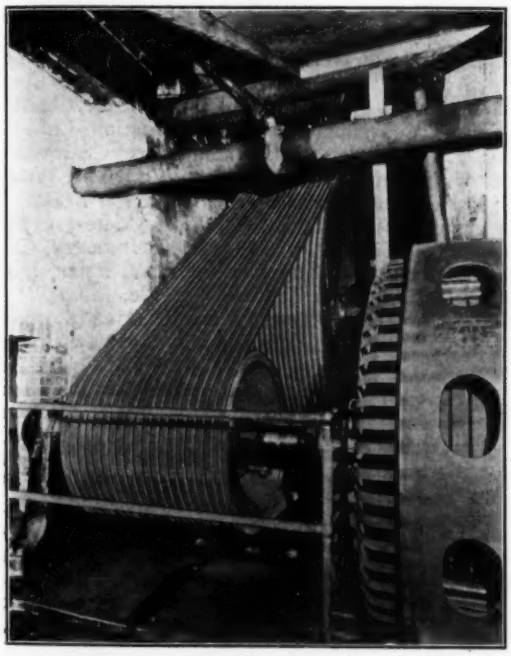
Hans Lagerloef, president and treasurer; Maurice London, vice president; Vilhelm Ramsey, secretary; Robert E. Krudener, western sales manager, and Ernest Erickson.

Cutting Costs With V-Drives

Many forward-looking plant managers with sharp-pointed pencils and looking for ways to keep down costs while stepping up production, are finding power transmission a fertile field for investigation. For when waste power, waste space, noise, operating shocks, ineffective grouping of drives are eliminated savings are bound to appear. Frequently the solution to the problem is found to be the V-drive.

Five years ago a New England paper-making plant was becoming increasingly dissatisfied with an important drive. Wear, noise, oil, were continual reminders that something ought to be done.

This drive is on a 400 hp. water wheel operating a generator. This generator is phased with an outside source



NINETEEN 4E18 V-BELTS

On a 400 hp. drive from a water wheel to a generator. This installation is in a paper mill in Massachusetts. The generator is phased with an outside source of power through the maintenance of an exact generator speed under all load conditions by means of the V-belt drive.

of power, requiring an exact driven speed under all load conditions. The requirements of the drive and the advantages offered by the several available methods of transmission led to the selection of a V-drive.

To do the job, nineteen 4E98 Gilmer V-belts were installed. This drive has proven low in cost to maintain, requiring no lubrication or belt dressing. It is silent. Efficient at low tension, it is easy on bearings. Generator speed has been maintained in a dependable ratio of power.

Among the drives in the paper-making industry using V-belts effectively are those on beaters, pumps, paper machines, jordans, screens, chippers, calendar stocks, fans, agitators, barking drums, slashers, wet machines. Modernizing such drives point the way to substantial economies and improved operating records.

Fibre Making Processes, Inc. Moves

Fibre Making Processes, Inc., announces the removal of its office to the Tribune Tower, Chicago. The telephone number is Superior 1046-7.

Claim 20 Per Cent Reduction in Duty

When the United States Customs Court reached the cases involving the claim of various paper importers that their merchandise was entitled to the 20 per cent. reduction in duty granted to imports from Cuba, through most favored nation treaties, the cases were all suspended to await the decision of a test case involving Italian cheese. The same claim was made by the importer of the cheese, and there will be no trial of the claim of the paper importers until the Italian case is decided. Meanwhile the same claim is being made by other importers of paper and a large number of cases involving this issue are now officially before the courts.

The Government has taken decisive action to check the operation of the German barter system, under which paper is being purchased for export to this country with discounted German marks. In some cases the discount is as high as 37½ per cent.

Taking a specific grade of paper as an example, the Import Committee insisted that the German barter procedure constituted an evasion of either the Tariff Act or the Anti-Dumping Act, by allowing sales to be made at less than a true value of the merchandise. The Customs officials at Washington, apparently agreeing with this argument, have issued orders to all ports that a complete investigation be made of every importation from Germany.

Any shipment of paper coming into any port in this country will be released to the importer only under bond to meet any duty that may be levied. An investigation will then be made to disclose all details of the transaction, price paid, manner of payment, and what kind of currency was used for the purchase. Appropriate action will then be taken, depending on the method used by the importer to evade the payment of a proper duty or to secure admission of the merchandise at an unduly low price.

Not only does this procedure apply to the paper which was the subject of the Import Committee's action, but to imports of any other German paper. By making the issue broad—using one grade as a specific illustration—the Government was convinced that the situation was so serious as to require immediate action.

September Newsprint Statistics

Production of newsprint in Canada during September 1935 amounted to 223,892 tons and shipments to 225,403 tons, according to the Newsprint Service Bureau. Production in the United States was 71,416 tons and shipments 73,161 tons, making a total United States and Canadian newsprint production of 295,308 tons and shipments of 298,564 tons. During September 27,161 tons of newsprint were made in Newfoundland and 1,540 tons in Mexico, so that the total North American production for the month amounted to 324,009 tons. Total production in September 1934 was 297,889 tons.

The Canadian mills produced 95,254 tons more in the first nine months of 1935 than in the first nine months of 1934, which was an increase of 5 per cent. The output in the United States was 42,651 tons or 6 per cent less than for the first nine months of 1934, in Newfoundland 12,885 tons or 5 per cent more, and in Mexico 627 tons more, making a total increase of 66,115 tons, or two and three-tenths per cent.

Stocks of newsprint paper at Canadian mills were reported at 73,818 tons at the end of September and at United States mills 16,490 tons, making a combined total of 90,308 tons compared with 93,564 tons on August 31, 1935.

Model ELN-6 Elevator Truck

In 1919 The Elwell-Parker Electric Company built the first tiering type of power industrial truck ever produced in the industry. The experience of both the manufacturer and customers nation-wide during the ensuing 16 years have brought about notable improvements. All of these are embodied in the new, thoroughly modernized Elwell-Parker Type ELN-6 elevator truck. Capacity is 6000 lbs.; electric or gas-electric power.

Outstanding improvements begin with increased sturdiness of construction. The frame is built of extra large commercial shapes, securely reinforced with heavy angles and gusset plates, either welded or riveted. This provides not only for normal loading, but insures rigidity of the frame, even when platform is at maximum height. Ball socket steering rods are located inside wheel base. Good clearance space beneath truck increases its cruising radius.

Engineers consider that the replacement of cable with chain in this size for hoisting and lowering loads, has certain advantages in construction, and also in truck performance. The rugged chains, either of which will lift the rated load, serve to simplfy construction and increase truck efficiency. Operator stands on rubber pedal pads which greatly add to his comfort by absorbing vibration as truck travels rough surfaces.

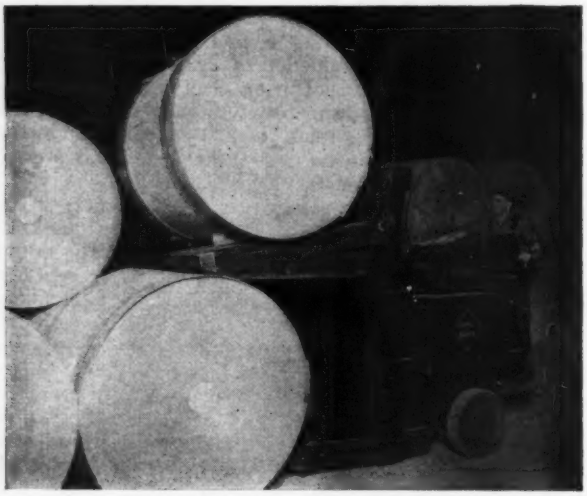
With telescoping uprights, the platform elevates 62½ inches before inner uprights begin to rise. Loaded skids may be tiered in box cars or other places having low headroom. In warehouse or in the open, the loaded, skid may be raised to a height of 10 feet and more.

Automatic cut-out switches are provided to stop platform at both upper and lower limits of travel. Interlocking control between travel controller, drive motor and foot pedals make the truck virtually proof against accident. Since operator must be standing on the pedals before truck can move, accidents are eliminated. Ample provision is made to accommodate either battery or gas-electric unit. Dynamic braking can be obtained for ramp operation, if desired.

Loads are assembled on skids and may be tiered in warehouse or box car, as units, merely by elevating or lowering the platform. As width has been reduced to a minimum, the new trucks can pass through narrow aisles; while telescoping uprights can be lowered so the truck will pass through doorways, and into box cars.

The truck itself is 41 inches wide and 128 inches long with a 27 by 54 inches platform. The height of platform in low position is 11 inches. Truck steers on all four rubber tired wheels, and turns in 66 inches intersecting aisles. Wheel steer is standard, but horizontal or vertical lever steer may be furnished if desired. There is ample clearance underneath truck.

With this combination of minimum width and height, the new truck can readily be used in old factory buildings as well as new, and in the open as well as in cramped quarters.



HI-LO TRUCK WITH PULL-ON ROLL-OFF MECHANISM

Paper and Pulp Section Elects Officers

The Paper and Pulp Section of the National Safety Council at its annual convention at Louisville, Ky., October 14-18, elected the following officers:

General Chairman, E. E. Grant, Crystal Tissue Company, Middletown, Ohio; Vice-Chairman in Charge of Membership, F. L. Irvin, St. Croix Paper Company, Woodand, Me.; Secretary and Program Committee Chairman, George J. Adams, International Paper Company, New York, N. Y.; Engineering Committee Chairman J. H. Turner, Consolidated Paper Corporation, Ltd., Grand-'Mere, P. Q., Can.; Statistics Committee, Chairman A. E. Winslow, Hollingsworth & Whitney Company, Waterville, Me.; Poster Committee Chairman, Clayton Braatz, Marathon Paper Mills, Rothschild, Wis.; Contest Committee Chairman, A. Scott Dowd, *The Paper Industry*, Chicago; Health Committee Chairman, Dr. E. W. Paine, Hollingsworth & Whitney Company, Waterville, Me.

Members at Large: Ernest Augustus, Mead Corporation, Chillicothe, Ohio; W. J. Brennan, Maine Department of Labor and Industry, Augusta, Me.; D. B. Chant, Ontario Pulp and Paper Makers' Safety Association, Toronto, Ont., Can.; T. L. Christensen, Continental Paper and Bag Corporation, Marinette, Wis.; Kenneth L. Faist, Champion Paper and Fibre Company, Hamilton, Ohio; W. A. Gleason, Hammerwill Paper Company, Erie, Pa.; J. J. Hastings, Port Huron Sulphite and Paper Company, Port Huron, Mich.; Don E. McDowell, Kalamazoo Vegetable Parchment Company, Kalamazoo, Mich.; W. J. Peacock, Northern Paper Mills, Green Bay, Wis.; J. J. Plzak, Consolidated Water Power and Paper Company, Wisconsin Rapids, Wis.; Samuel Pruyn, Finch-Pruyn & Co., Inc., Glen Falls, N. Y.; F. A. Robinson, Kimberly-Clark Corporation, Neenah, Wis.; B. D. Rogers, Bird & Son, Inc., East Walpole, Mass.; F. H. Rosebush, Nekoosa-Edwards Paper Company, Port Edwards, Wis.

New York Reports Improvement

[FROM OUR REGULAR CORRESPONDENT]

HOOSICK FALLS, N. Y., October 28, 1935—Improvement in business conditions is reported from virtually all manufacturing plants connected with the paper industry in this section. Officials of the Wood Flong Company assert that the improvement is the result of an increase in newspaper advertising throughout the country, the demand for mats consequently being greater. The concern produces dry mats which are user by most newspapers for casting press plates. It was stated that the company is not yet back to the 1929 level although headed that way.

The Noble Wood Machinery Company, paper machinery manufacturers, also notices improvement and full time schedules are being observed with about 100 men. The upward trend has been most pronounced during the past few months and officials report an increase in inquiries. An official declared that business men are displaying a greater degree of confidence than has been shown in some time.

LOCKWOOD'S DIRECTORY
FOR 1936

Contains

11,462
Changes

In order to accurately record the information concerning this industry in one year we found it necessary to make the following additions, eliminations and changes of address.

List	*Number of Changes*
Mill Data Section	1216
Classified Section	916
Mill officials Section	1065
Watermarks & Brands Section	1100
Paper Merchants	800
Equipment List	2450
Addresses	3260
Miscellaneous Lists	655

Lockwood's Directory contains the following information accurately compiled and corrected to date

City Address of Mills and Mill Supply Houses
Classified List of Paper Mill Products, Canada
Classified List of Paper Mill Products, United States
Classified List of Pulp Mill Products, Canada
Classified List of Pulp Mill Products, United States
Coated Paper Manufacturers
Envelope Manufacturers
Glazed and Coated Paper Manufacturers
Idle Mills
Index to Mills
Machinery and Equipment Manufacturers
Mill Officials
Pad Manufacturers
Paper Merchants, Canada
Paper Merchants, United States
Paper Stock and Rag Dealers
Paper Bag Manufacturers
Paper Box Manufacturers
Paper and Pulp Mills in Canada
Paper and Pulp Mills in United States
Paper and Pulp Mills in Cuba, Mexico
Paper Specialties
Papeterie Manufacturers
Prepared Roofing Paper Manufacturers
Pulp Testing Chemists
Rags and Paper Stock Consumed by the Mills
Statistical Table of Mills
Tablet Manufacturers
Tag Manufacturers
Toilet Paper Manufacturers
Trade Associations
Twine Manufacturers in United States and Canada
Vegetable Parchment Paper Manufacturers
Wall Paper Printers
Watermarks and Brands
Waxed Paper Manufacturers
Wood Pulp Importers

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.....193 .....

Valley-Voith Screw Press Expands Field

The screw press is a machine covering a peculiar field in pulp thickening. It thickens pulp from any slushing consistency to a discharge consistency of 20-40 per cent. Originally imported from Germany for a few specialized applications, it fitted so perfectly into the high density bleaching picture that in a brief three years some 35 presses were installed in this country. With the screw press it is not necessary to have a dilute pulp so as to form a sheet, as in the case of cylinder type thickeners or filters; the screw press takes slush pulp just as it comes and squeezes up to 90 per cent of the water out of it.

Naturally, this feature was found of interest in other pulping processes and at the present time many mills have successfully applied the screw press to a number of problems. Two mills with black liquor or washing systems insufficient for their requirements took the pulp from the last washer at around 9 per cent consistency and squeezed it up to 30-40 per cent. This was no great water removal—only 8½ pounds of water per pound of fiber—but it removed 85 per cent of the residual impurities. Moreover the pulp discharged at high consistency gave an excellent opportunity for the use of white water for dilution at this point. The effluent from the screw press went back to the washing system.

In other mills screw presses thicken slush stock from the pulp mill to 25 per cent or thereabouts; the thickened stock goes to the beaters where it immediately absorbs the excess from the paper machine, with its valuable components of alum, color, size, etc. The paper machine excess white water is thus immediately reused without the use of savealls.

Another installation discharges pulp from the screw press into a railroad box car beneath, the car is filled and the pulp is shipped at a cost so much less than that of operating wet machines that there is no comparison.

A further application, as yet not used in this country but very prevalent in Europe, is in the pneumatic transportation of pulp. Pulp from the screw press enters a special feeder and is blown by compressed air to distances up to half a mile for storage or shipment. In some installations a hopper is mounted above each beater and the pulp is blown to the respective hoppers so that each beater is equipped for very rapid refilling as soon as its current charge is dropped.

In a number of other mills screw presses have been installed in processes when the pulp is chemically treated after manufacture and this treatment is conducted at high consistency. The details of these installations are closely guarded by the mills in which they are used and it is not permissible to divulge information concerning them.

A new application upon which work is now being done was suggested in a recent article[1] by Sidney D. Wells. It concerns a combination of screw press and rod mills in the manufacture of straw pulp; straw from the cookers drops to a breaker beater for a preliminary shortening and washing, thence to a screw press where the wash water is squeezed out. A large saving is here effected in both horsepower and water consumption and the screw pressed stock goes to the rod mills at a uniform, high consistency which extracts the optimum operating results from these machines, since rod mills do not require higher power at high consistency but give a greater tonnage and increased beating when so operated.

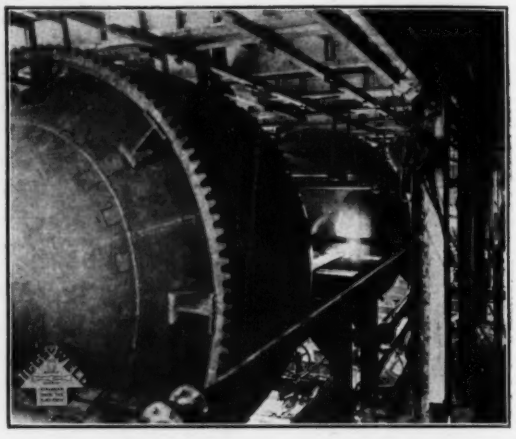
The evolution of the Valley-Voith Screw Press has been interesting. From its inception the demand has been for increasingly higher consistency and the manufacturers have been hard pushed to keep their design up to the standards required by the difficult conditions imposed by some installations. But the machine has been so modified, strengthened and successively improved that the original users would have difficulty in recognizing the current machine.

[1] Paper Trade Journal, April 4, 1935.

Heald Co. Installs Biggs Digesters

The accompany illustration shows two additional 14 feet Biggs Welded Digesters, made by the Biggs Boiler Works Company, being installed in the plant of the Jno. H. Heald Company at Lynchburg, Va.

This installation will make a total of seven Biggs Welded Digesters in the Jno. H. Heald company plant. The



INSTALLATION OF BIGGS WELDED ROTARY DIGESTERS

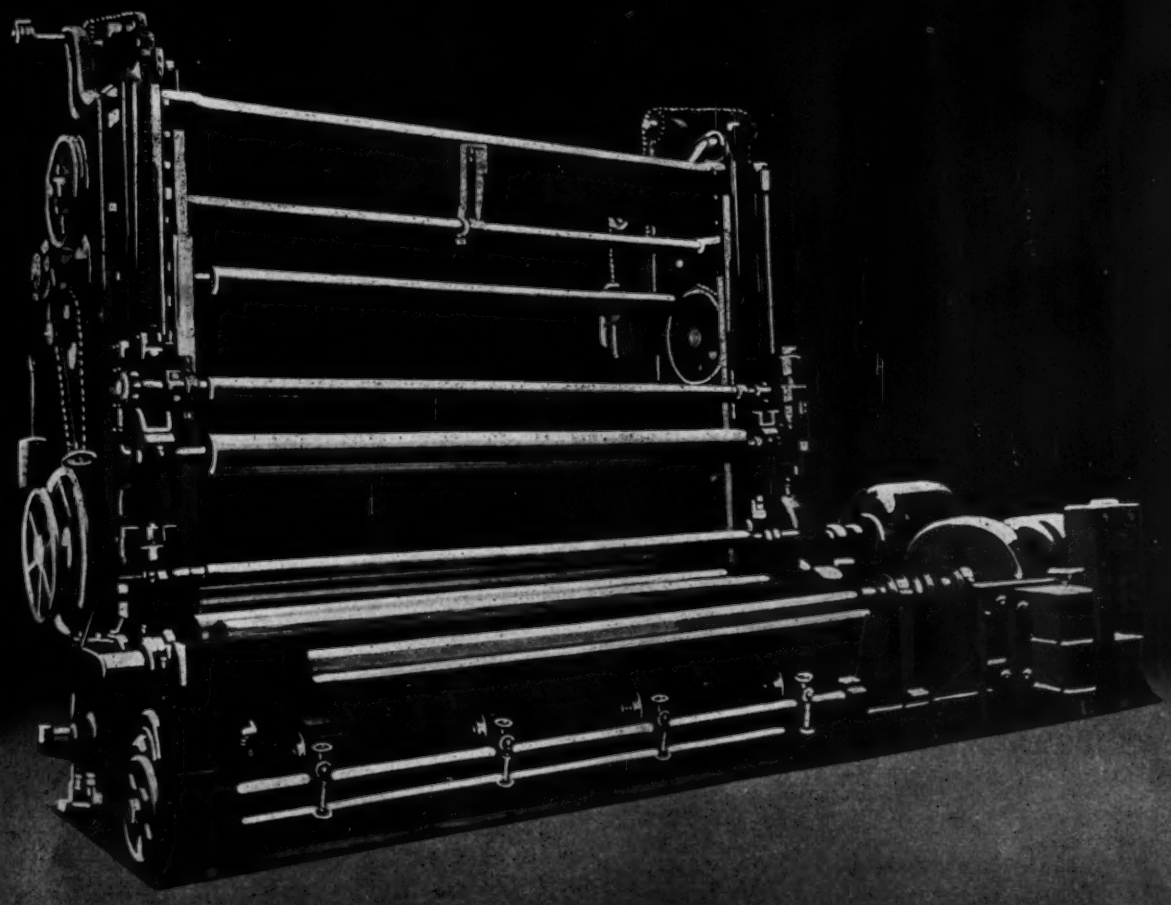
original installation of five digesters has been in service at the plant since 1929. The company, it is stated, has found these rotary digesters entirely satisfactory for use in connection with its semi-chemical process for manufacturing paper board products.

The digesters are used for the softening cook which is the preliminary step in the process. The design, it is said, facilitates the circulation of the cooking liquor and the filling and dumping.

M. & O. Staff Changes

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, ILL., October 28, 1935—The Chicago paper world found a lot to become interested in with the announcement that the Minnesota and Ontario Paper Company had transferred several executives of its sales office from the Minneapolis headquarters to a new sales location at 205 West Wacker Drive, Chicago. The Chicago offices will be under the supervision of J. H. Mager, formerly of the Minneapolis office and already well acquainted in this territory. The new outlet will handle the manufacturers' sales of ground wood papers. The offices are next door to those of the Seibert Paper Company, for some time representatives of Minnesota and Ontario for kraft wrapping and kindred lines. The Seibert organization, headed by Jake Seibert, will continue to represent these lines in this territory. Paul Joslin, for nineteen years connected with the Flambeau Paper Company and, during the past two years, with the Chicago offices of Flambeau, has accepted a position as merchants sales representative for Minnesota and Ontario in Chicago. His long experience with Flambeau makes him well capable of handling the groundwoods sales of the concern.



SHEAR CUT IS A CLEAN CUT

SAMUEL M. LANGSTON COMPANY

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THE MILL AND MILL EQUIPMENT NUMBER

The PAPER TRADE JOURNAL with this issue resumes the publication of its Annual Mill and Mill Equipment Number. This number was first published in 1924 and was issued regularly late in the fall until last year, when the obvious lack of available material made it advisable to suspend its publication for the time being. It may be seen, therefore, that the resumption of this number at this time is a really tangible sign of the improvement of business in general and of the betterment of conditions in the pulp and paper industry in particular.

The purpose of the Mill and Mill Equipment Number is to describe and illustrate new mills and improvements to going mills as well as to review advances that have been made in pulp and paper-making machinery and paper-making processes in the more or less recent past. The situation as regards the building of new pulp and paper mills has during the year, as during the several years past, continued rather inactive. In fact, there are at the present time only several instances of ventures of this kind being undertaken. These include the impressive new sulphite mill of the Pulp Division of the Weyerhaeuser Company at Everett, Wash., which is to go into operation in the spring of 1936; the sulphate pulp mill and kraft paper mill of the Union Bag and Paper Corporation of Ga., the construction of which has just been started, and the sulphate pulp and kraft paper mill of the Crossett Lumber Company at Crossett, Ark., for which a loan of $3,850,000 was obtained from the Reconstruction Finance Corporation during the summer.

In spite of the fact, however, that the industry has shown little expansion in productive capacity, there has been a decided awakening in the industry to the need for improvements, not only in the pulp and paper mills themselves, but to power units connected with the mills as well. Quite a number of the outstanding instances of such improvements to the mills and the power houses are described in this issue of the Mill and Mill Equipment Number and they make interesting reading not only as showing a revival of the industry, but also perhaps and more especially because they point out many important advances that have been made recently by some of the more enterprising mills in their endeavor to make more paper at less cost and without decreasing the quality of the product.

This objective is becoming constantly more important. In the years just ahead more than ever this objective will have to be met successfully by the mills who wish to maintain their competitive position. Splendid advice as to just how each mill should study its individual problem along these lines is summed up by another writer in this issue, who says:

"The places where modernization investments can be made to increase earnings are many and varied and, in general, depend on the process, operating conditions, and type of equipment employed in the individual mill. Broadly speaking, modernization will be profitable when equipment has reached a point where, because of old age or wear, its maintenance becomes so high that it is cheaper to install new equipment than to pay the high cost of repairs for the old. When this condition exists, more money may be wasted in operating obsolete equipment, which adds to losses indefinitely, than is needed to buy modern, improved equipment which pays for itself and then adds to earnings. A second condition might exist where through wear or obsolescence the machine lacks accuracy and its use results in considerable waste of product and labor. Here, too, a capital investment for a modern unit should add to earnings. As a third consideration, the equipment may be operating successfully, but new developments and increased operating efficiencies may permit the same work to be done at such a decrease in cost that a capital expenditure can be liquidated in a reasonable length of time.

"'In addition to the direct economies which can be evaluated in dollars and cents, it should be remembered that practically every investment for the right kind of up-to-date equipment and methods results in many other tangible benefits, the importance of which must be gauged by the individualities of the mill. These benefits might be summarized as greatly improved operating conditions, increased reliability and continuity of service, greater flexibility and adaptability to changing conditions, and a stronger competitive position made possible by improved quality of product and, consequently, greater consumer acceptance."

MONEY FOR PLANT MODERNIZATION

Operators of pulp and paper mills, in good financial position, have a new $50,000 line of installment credit. This money may be obtained for plant rehabilitation or the purchase and installation of certain types of machinery and equipment.

The source of these funds is any private financial insti-

tution (bank, trust company, building and loan association), that has a contract of insurance with the Federal Housing Administration. No loans are made by the Housing Administration.

To obtain this money under this Modernization Credit Plan, as it is called, the mill operator, either individual, partnership or corporation, should take an inventory of the work needed and have an estimate made by a reliable dealer. These should be presented at the institution selected by the applicant, which will then require a credit statement and balance sheet.

In addition the Administration recommends that collateral be required which may be in the form of endorsement, co-signers to the note, chattel mortgage, conditional bill of sale, or bailment lease. If the collateral offered is acceptable, the applicant adjudged able to make the repayments, and the work he wishes to do found eligible, the money is advanced.

Charges for this insured credit are reasonable. They may be as low as is consistent with sound banking practice, but may not exceed the equivalent of a $5 discount per $100 original face of a one-year note repayable in monthly installments. This charge includes interest. The borrower is privileged to drive his own bargain as the Federal Housing Administration only sets a maximum and does not attempt to say what the exact rate of any loan should be.

The duration of the loan is a matter to be decided between the applicant and the lending agency and may be for as long a term as five years. All repayments are made in equal monthly installments over the lifetime of the obligation.

Plant modernization, that is the real property, which is eligible to be financed under the Modernization Credit Plan, includes all additions, alterations, repairs and modernization.

As to equipment and machinery, the Federal Housing Administration will be glad to give a ruling on any item if the applicant will furnish a description of the machine, pereferably together with a picture. Broadly speaking, any machinery or equipment that is particularly adapted to the pulp and paper business and which is necessary to the operation of the mill, can be financed with insured credit. If upon installation it becomes a permanent part of the property, it is eligible. If there is any doubt about an item, a letter to the Federal Housing Administration, Washington, D. C., will clarify the matter.

Replacement parts, but not mere repairs, may also be financed. No portable appliances, or hand tools, are eligible.

Money for financing the rehabilitation of mill-owned worker's houses is also available, in amounts up to $2,000 per house, under the Modernization Credit Plan. Procedure in this is similar to that in the $50,000 classification.

The St. Regis Paper Company has removed its main office to 230 Park avenue. The office was formerly at 60 East 42nd street, New York.

Production Ratio Report

This production ratio report is based upon paper production reports to the American Paper and Pulp Association, New York City.

COMPARATIVE MONTHLY SUMMARIES

1935	Total Production Ratio	1934	Total Production Ratio
January	65.8%	January	——
February	7.0%	February	——
March	70.5%	March	——
April	70.0%	April	——
May	69.4%	May	——
June	72.3%	June	——
July (b)	67.8%	July	——
August	70.9%	August	——
September (c)	75.0%	September (c)	59.4%
October	——	October	64.7%
November	——	November	61.7%
December	——	December (a)	62.1%

COMPARATIVE WEEKLY SUMMARIES

Current Weeks, 1935		Corresponding Weeks, 1934	
*October 5	75.2%	October 6	65.2%
*October 12	76.4%	October 13	64.3%
*October 19	73.5%	October 20	66.1%

The following statistics show the number of mills reporting by ratio groups:

NUMBER OF MILLS REPORTING, CURRENT WEEKS

Ratio Limits	October 5 1935	October 12 1935	October 19 1935
0% to 50%	97	83	68
51% to 100%	246	253	193
Total Mills Reporting	343	336	261

* Subject to revision until all reports are received.

These data exclude (a)—Christmas Day, (b)—Fourth of July, (c)—Labor Day.

Paperboard Operating Ratios

According to reports from the National Paperboard Association per cents of operation, based on "Inch-Hours" were as follows:

1934	1935	1935
September—62%	January—61%	May—61%
October—63%	February—67%	June—65%
November—56%	March—67%	July—59%
December—53% (a)	April—61%	August—65%

1935

September 7, 1935—61%
September 14, 1935—72%
September 21, 1935—71%
September 28, 1935—75%

Week ending October 5, 1935—75%
Week ending October 12, 1935—76%
Week ending October 19, 1935—75%

Work on Union Bag Mill Progressing

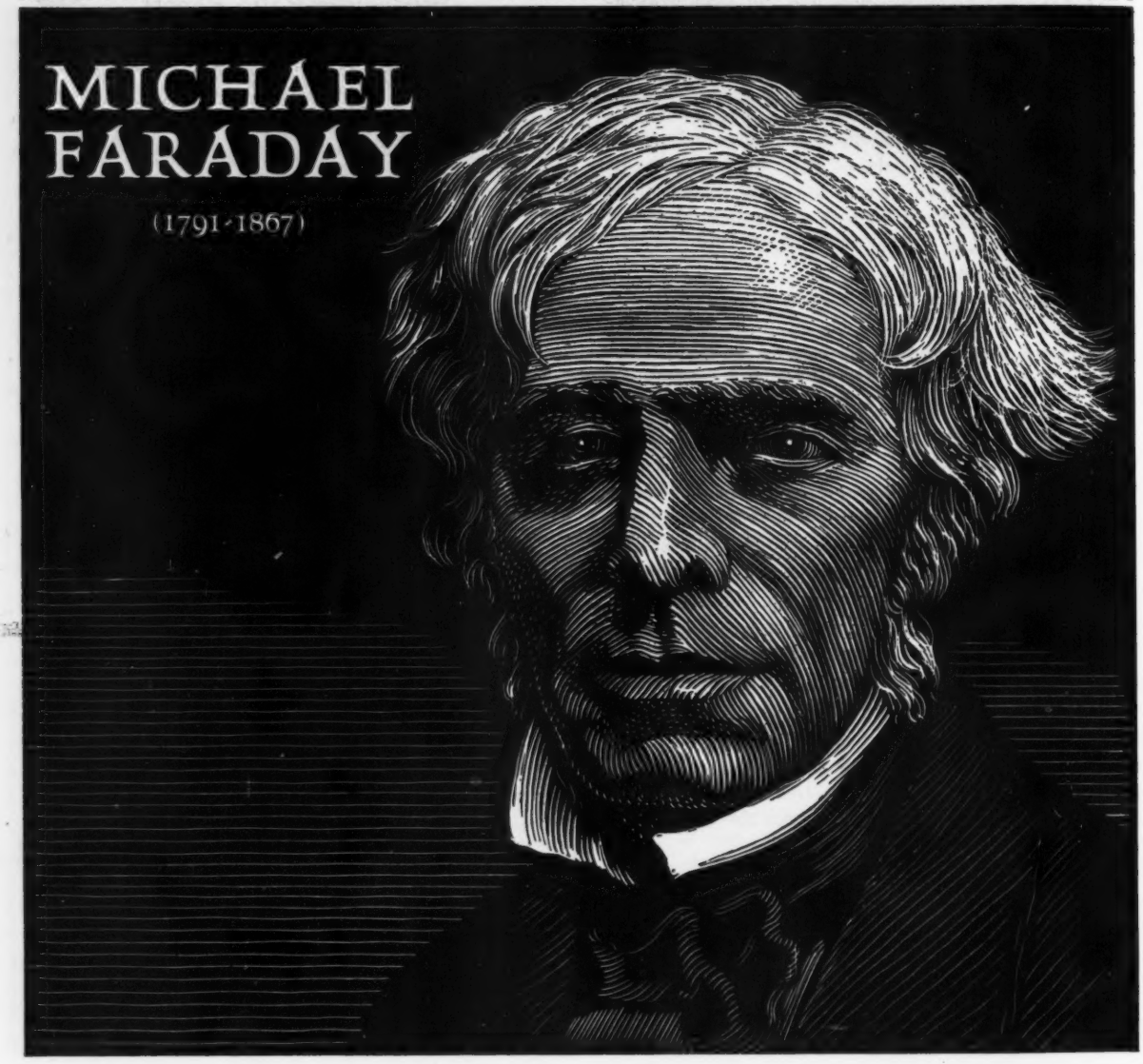
Alexander Calder, president of the Union Bag and Paper corporation, has reported to stockholders that all plans relating to the company's new pulp and paper mill at Savannah, Ga., are progressing satisfactorily.

"The work accomplished to date," he said, "conforms with the time schedule, and all expenditures are within the preliminary estimate."

Mr. Calder's remarks accompanied the announcement that directors of the corporation had declared a dividend of fifty cents a share on the capital stock, payable November 1 to stock of record October 28. On July 25, last a similar disbursement was made. Concerning general business conditions, Mr. Calder said that his prediction of a month ago that business would be better and that higher prices would prevail in the paper bag industry had been justified by subsequent developments and that the steadily improving volume at higher prices had the outlook 'very encouraging.'

"The demoralization of the first six months of 1935 was naturally reflected in a very conservative buying policy on the part of both consumers and distributors," he said. "In spite of advancing prices, therefore, stocks in the hands of buyers are still low, and there is every indication of a good volume of business during the remaining months of the year, which will come in at the new and considerably higher price levels," President Calder stated.

NUMBER TWO OF A SERIES OF FAMOUS PIONEERS IN CHEMICAL HISTORY



MICHAEL FARADAY, best known for his pioneer work in experimental electricity, was also a pioneer in the liquefaction of gases, notably chlorine. Thus, early in the 19th century, he laid the groundwork both for the modern electrolytic manufacture of chlorine and for present-day methods of chlorine distribution. Nearly a hundred years passed, however, before liquid chlorine came into its own as an important industrial commodity. Mathieson, first to manufacture chlorine products in the United States, has always been in the forefront of new developments in the production, distribution and efficient application of liquid chlorine.

On March 5, 1823, a visiting scientist at the Royal Institution, London, criticized Michael Faraday for using soiled glassware in his experiments with chlorine hydrate. The next day the visitor received a note from Faraday reading: "Dear Sir: The oil you noticed yesterday turned out to be liquid chlorine. Yours faithfully, Michael Faraday."

The MATHIESON ALKALI WORKS (*Inc.*), 60 East 42nd St., New York, N.Y.

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Section of the
Technical Association of the Pulp and Paper Industry
Edited by Ronald G. Macdonald, Secretary

Some Recent Developments in Bleaching Chemical Wood Pulps*

John D. Rue[1]

The bleaching of chemical wood pulps has undergone, during the past six to eight years a development which can be considered almost revolutionary. Improvements in processes have brought decreased cost of bleaching and increased quality of products. The improvements in processes have made it possible to bleach kraft pulps with the result that there is in progress a process shift in which the sulphite industry is losing ground to the sulphate industry.

Earlier Developments

For many years prior to this recent period of especial interest progress in bleaching had been made but not by the introduction of radical methods of procedure. The outstanding developments during the first quarter of the present century have been limited chiefly to (1) Displacement of bleaching powder with liquid chlorine from which the pulp mill made its own bleaching solutions. (2) Introduction of bleaching equipment so designed that pulps of consistencies up to 15 per cent and over can be satisfactorily circulated, and (3) introduction of two stage bleaching using hypochlorite in both stages. Furthermore credit is due to the technical and administrative men of the industry for superior methods testing and of operating control.

Introduction of Chlorination

Then came the introduction of direct chlorination as a stage of operation associated with the bleaching of chemical pulps. Many, at least, of the advantages of direct chlorination had long been known but practical application of the reactions had awaited the perfection of materials of construction essential to the economic and dependable handling of the corrosive mixture of pulp and chlorine. Among the materials of construction now available are rubber lined steels, special corrosion resistant alloys and acid and chlorine proof cements and coatings. With the advent of chlorination came an intense activity in a study of its application to the improvement of economy of production and of the quality of product in bleached sulphites to the improvement of the color of soda pulps, to the development of new bleached products in the field of kraft and to the extension of the manufacture of improved pulps suitable for rayon.

* Presented at the meeting of the Proposed New York Section of the Technical Association of the Pulp and Paper Industry, Syracuse, N. Y., October 12, 1935.

[1] Member TAPPI, Hooker Electrochemical Company, Niagara Falls, N. Y.

Methods of Chlorination

There are already in successful commercial operation in this country several methods of chlorination. The factors which differentiate these methods are chiefly (a) method of adding the chlorine to the pulp, (b) method of mixing pulp and chlorine, (c) length of the period of chlorination reaction and (d) degree of chlorination.

The last two factors will be discussed in connection with the application of chlorination to the different kinds of pulp. We may now consider briefly the various methods based on the first two factors.

Common to all the commercially used methods of chlorination is the fact that they are carried on at pulp consistencies ranging normally between 3 and 5 per cent. For the most part the temperatures of reaction are those naturally met with in stocks in the brown stock chests. They range from just above freezing in winter manufacture of sulphite to about 40°C in summer manufacture of kraft in the south. Temperature control is not a differentiating feature of chlorination methods.

In the following description of chlorination methods reference is made only to those installations with which the author is personally familiar. No claim is made that the list covers the field completely.

Batch Methods

Pulp mills are accustomed to batch methods of pulping, bleaching and beating and it is natural that batch methods of chlorination should have found favor with many mills. Efforts were successfully made to use existing mixing equipment, where available, in which to chlorinate. In several mills a bellmer bleacher has been spared for this purpose. The chlorine is evaporated and the gas injected with water to the intake of the circulating worms. The water serves in part to dissolve the chlorine and in part to disperse it to a degree that ensures absorption by the pulp without escape of chlorine gas. This method is applied to sulphite pulps and up to about 80 lbs. of chlorine per ton of pulp are applied. The injection period usually does not exceed 20 or 30 minutes and the total chlorination period about 50 minutes. The actual quantity of chlorine added is limited to that which can be added and absorbed within those periods.

Protection of the bellmer tub and circulating mechanism is obtained by coatings of so-called S-D-O (Synthetic Drying Oil) or of one of the several Tornesit paints which are

now on the market. The base material for the latter is a chlorinated rubber product. In some cases the bellmer worm and worm housing are protected with rubber. The injectors are usually Duriron and the chlorine water piping is protected with rubber.

For mills which do not have spare equipment available for chlorination several types of tanks are now obtainable. These operate on the central vertical draft tube principle and provide complete circulation of the stock. They have sufficient depth of stock to ensure complete absorption of the chlorine. Circulation, usually downward through the draft tube, is obtained with a ship's type propeller of relatively large diameter and slow speed, or with a flat bladed propeller of smaller diameter and greater speed, or with a pump propeller of small diameter and high speed. In each case the chlorine in the form of gas is admitted in the region of high turbulence set up by the propeller. The stock at 3 to 3½ per cent consistency is circulated at the rate of one complete turn over in 1 to 3 minutes. In the periods of injection and of chlorination and in the degree of chlorination these methods do not differ distinctively from the bellmer methods.

A special problem arises in converting mills using baled pulps for the pulp must first be reduced to slush before chlorinating. An ingenious solution has been found for at least one mill in the application of a Bond-Hayton breaker unit to a specially stream lined chest. The stock which is first broken in this equipment is charged with chlorine by injecting the gas at a point near the inlet of the breaker propeller. Protection against corrosion is provided with Tornesit paint on both tank and breaker parts.

In some cases, where baled pulp is used, weighed batches are reduced to slush and made up to volume for uniformity of consistency. Adequate facilities are provided for breaking and for storing the individual batches of slush pulp pending their transfer to the chlorinators.

In all the batch methods the chlorine is weighed out in pressure containers on scales and evaporated just before it is admitted to the pulp. For very accurate control the chlorine demand of the pulp is determined in advance of the chlorination. Suitable quantities of chlorine can then be added so that the bleachability of the chlorinated batches is substantially uniform.

Continuous Methods

Facilities are now available so that chlorine of regulated flow can be added to stock of uniform rate of flow and the rate of proportions adjusted at will. Furthermore it is possible to satisfy the variable chlorine demand of the pulp so that a chlorinated product of substantially uniform bleachability is delivered from the chlorinator.

An advantage of well operated continuous processes over batch processes is the low labor cost involved. Large rates of continuous production can usually be handled with about the same labor as is required for relatively small rates. In batch operation the number of operations increases in proportion to the increase in output and the labor requirement is increased accordingly. Moreover, in the case of pulp mills the chlorination stage occurs between the continuous washing of the brown stock and the continuous washing of the chlorinated product. If the chlorination can be made continuous the need for surge storage capacity before and after chlorination can be kept at a minimum.

In one continuous method chlorine gas is injected into a stream of stock which is immediately passed through a power driven mechanical agitator which discharges at the bottom of a reaction tower. The reaction tower provides retention for 20 to 30 minutes and discharges the chlorinated stock by overflow at the top of a washer. The stock is forced through the system by the brown stock pump.

The stock is handled in wood stave piping. The power mixer is constructed of one of the corrosion resistant alloys and the tower of wood staves. The equipment has proven satisfactory for the mild chlorination of sulphite pulps. The chlorine injection is regulated on the basis of the consistency of the pulp, the rate of pulp flow and the measured chlorine demand of the pulp. Any irregularities in the bleachability of the chlorinated product are compensated for by the proportioning of the bleach in the subsequent stages.

In another continuous method evaporated chlorine is absorbed in water in a tile filled tower. The chlorine water is run directly along with a stream of stock to the bottom of an agitated tank from which the mixture overflows to a series of retention towers of earthenware and concrete construction. Here again only a mild degree of chlorination is given the pulp.

In still another method chlorine water is prepared and stored in a rubber lined tank and pumped through rubber lined piping by means of a rubber pump. The chlorine water is metered into the stream of pulp and the reaction period is provided by a tile retention tank without agitation.

In another installation evaporated chlorine is injected into a stream of water as it enters the bottom of a tile lined concrete tank filled with coarsely crushed lime stone rock. The rate of flow is regulated by metering the water and by titrating the overflow of hypochlorous acid solution for available chlorine. The hypochlorous acid solution is injected into a stream of sulphite stock as it enters near the bottom of one end of a horizontal wood stave tank provided with horizontal shaft and paddle agitation. After about 25 minutes retention the chlorinated stock with or without the addition of lime, overflows the tank at the other end and passes on to the washer.

Still another method of chlorination provides for pumping the stock at uniformly regulated consistency from a constant level and under pressure through a closed rubber lined system consisting of a chlorine mixer, a chlorine reaction tower and a lime mixer. The chlorine is injected into the stock just before the latter reaches the internal baffle system which sets up sufficient turbulence to dissolve the chlorine and to bring it into intimate and uniform contact with the pulp. A definite but short period of reaction is provided. The period is purposely maintained too short to allow complete exhaustion of the chlorine. At the end of the reaction period, which is usually about five minutes, a titration of the water in contact with the pulp shows the residual available chlorine content. Chlorine injection is regulated so that the concentration of the residual available chlorine is substantially uniform. In that way irregularities in the chlorine demand of the pulp are provided for and a chlorinated product of substantially uniform bleachability is delivered. The subsequent handling of the pulp beyond the chlorine reactor in this method will be discussed later under the application of chlorination to the various kinds of pulps.

Injection of Liquid vs. Gaseous Chlorine

The personal experience of the author indicates that chlorine can be added to the stock as gas, as liquid, as chlorine water or as HOCl (Chlorine water neutralized with limestone) without, to any appreciable extent, altering the rate of reaction or the quality of the chlorinated pulp product. In adding the chlorine to stock or to water or to water containing limestone there are, however, practical operating advantages in first converting the liquid to gas. The gas as compared with the liquid, constitutes a larger

volume and requires larger valve openings for the same rates of chlorine flow. The flow of liquid chlorine can be regulated but greater attention is required to keep the valve in adjustment. The expansion, at the valve results in some vaporization of the chlorine with reduction of the temperature to below freezing. The valve becomes coated with ice. The packing soon impregnated with small amounts of chlorinated oils, becomes sticky and the valve operates with difficulty. The slight content of chlorinated oils forms on the valve a deposit which at the usually small openings progressively modifies the size of the effective opening and alters the rate of flow.

Evaporators are now available which operate automatically to deliver gas at constant temperature at the pressure of the chlorine container. Changes in container pressure occur gradually over rather long periods of time. Strictly uniform pressures can if desired, be obtained by automatically controlled air compressors supplying air to chlorine tank cars. Chlorine gas at uniform temperature and pressure is then readily available and ensures a uniform rate of gas flow at any given set of the regulating valve. This is an important factor in successful continuous chlorination.

Application of Chlorination To Various Kinds of Pulp

SULPHITE PULP

The commercial chlorination of sulphite pulp is relatively a very simple operation as regards (a) chlorine injection, (b) control of the proportioning of chlorine to pulp in its relation to the quality of the ultimate product, and (c) materials of construction for the chlorinating equipment. Relatively small quantities of chlorine are required. Usually not over about 80 pounds per ton of pulp. Consequently little difficulty is encountered in measuring the chlorine for batch operation or for bringing the chlorine into contact with the pulp. The requisite quantities are absorbed readily by the pulp and at no time during the process is the concentration of available chlorine or even of the total chlorine in the stock high. The corrosive action of the free chlorine and of the chlorinated products is sufficiently low that even wood can be used for the construction of the reaction equipment and for handling unwashed chlorinated stock.

The reaction period for batch operation need not exceed about 50 minutes for good results and for substantially complete exhaustion of the requisite quantities of chlorine. The chlorinated stock can, therefore, if desired be washed to remove the excess acid before neutralizing. This results in a material saving in lime. Vacuum washers of wood and cast iron construction have been used economically for the acid stock but now rubber protected washers are available at moderate cost and are superior for the purpose.

The addition to the washed stock of a small amount of caustic soda or of lime prior to the addition of the bleach liquor ensures a more complete removal of the chlorinated products from the fibers. It is not essential that the stock neutralized after washing be re-washed before bleaching. The small saving in bleach that would be effected would scarcely pay for the additional operation.

In the continuous methods in which the pulp continuously receives its full quota of chlorine the reaction period may be extended to exhaustion as in the batch methods or it can be terminated earlier by the addition of lime. The concentration of available chlorine after 5 minutes of reaction is rarely in excess of 0.2 g.p.l. in 3 per cent consistency stock. Addition of the lime materially reduces this concentration of available chlorine. Experiments have repeatedly shown that any residual available chlorine remaining after the lime neutralization reacts chiefly with dissolved compounds and only to a negligible degree has any favorable effect on the product. The neutralized pulp can then even after only five minutes chlorination period be sent directly to the washer. What residual available chlorine may remain can be permitted to react with the dissolved compounds in the sewer. The chlorine reaction equipment can then be kept at a minimum in size and cost and the penalty paid for the saving in cost of equipment and in installation space is not to exceed four pounds of chlorine per ton of pulp.

Maximum efficiency in the consumption of chlorine occurs when 40 to 60 per cent of the chlorine is added in the chlorination stage and the remainder added subsequently as hypochlorite. 20 to 40 per cent saving may be made in chlorine and lime by introducing a chlorination stage ahead of a single stage hypochlorite bleaching system. On the other hand, maximum strength properties are obtained when the chlorination is carried to a degree that only about 10 pounds available chlorine per ton are required to be added subsequently as hypochlorite.

In some sulphite mills, especially on the Pacific Coast, a third stage is added. The third stage may in some cases be a second hypochlorite bleach. In other cases the third stage consists in the addition of sufficient free chlorine to adjust the pH to approximately 7. The chlorine provides the necessary acid and at the same time keeps the pulp suspended in slightly oxidizing medium. A re-wash under these conditions appears to stabilize the color of the pulp.

The introduction of a chlorination stage in the bleaching of sulphite introduces also some problems of increased dirt which are not, however, insurmountable. Sulphite pulp always contains more or less resinous specks which originate around the knots and in the inner bark. These specks in the relatively long periods of hypochlorite bleaching are to a greater or less degree penetrated and rendered invisible. The chlorination reaction, however, is very rapid and renders the fibers easy bleaching to a greater degree than it does the dirt specks. Consequently in the subsequent hypochlorite stage with low concentration of bleach the pulp bleaches to full white more rapidly than do the specks. Provided the hypochlorite bleaching stage is of short duration, as is frequently the case in mills which have pushed the output of the bleaching equipment to its limit, the chlorinated pulp does not produce as clean a bleached product as does the single stage hypochlorite bleach. This condition is common to all methods of chlorination. The answer to this problem is, of course, found to consist of several parts. The hypochlorite facilities may be enlarged thus providing a longer, lower temperature bleaching period, perhaps at higher consistency. Better still the wood chips may be more thoroughly freed of knots and inner bark. This reduces the specks at the source. The screening and riffling of the unbleached pulp may be improved to advantage and the bleached pulp may be screened and riffled. The savings in chlorine and lime and the improved quality of product obtainable with direct chlorination may prove worth the cost even though these improvements in manufacturing procedure are found to be essential prerequisites.

SODA PULP

The standard of color of commercial bleached soda pulp has been very materially raised during the past few years by the introduction of direct chlorination. The behavior of soda pulp to chlorination is very similar to the behavior of kraft and we can, therefore, forego any further riscussion of soda at this time.

KRAFT PULP

The introduction of direct chlorination has made it possible to bleach kraft pulps to a relatively high white shade without appreciable loss in strength.

For pulps of about manila shade or darker a single stage hypochlorite bleach is rapid, economical and productive of pulps of excellent strength.

For pulps brighter than approximately a manila shade a chlorination stage preceding a hypochlorite bleach becomes increasingly essential to the production of color and to the maintenance of strength. Even with the usual kraft pulps as produced in this country pulps having very nearly the strength of the unbleached pulp can be produced by a two stage chlorine-hypochlorite process up to about the old shade of commercial bleached soda pulp.

For still brighter shades, i.e., those approximating bleached sulphite; the sulphate pulp should be specially digested and the bleaching process must include more than two simple stages. Three excellent imported bleached krafts of high color and high strength have recently come on the market and there is no reason to doubt that some of our domestic mills will be able to equal or exceed them in quality if they are not already doing so.

Kraft pulp contains a dye which resists tenaciously the whitening action of the bleaching processes. This dye is more readily soluble in hot caustic than in neutral or acid media. It is probable, therefore, that one of the several stages will have to consist of a hot caustic extraction probably inserted between the chlorination and the hypochlorite treatments.

The chlorination of kraft pulps presents several problems not encountered with sulphite. Chlorine demand of kraft pulps is from two to four times that of sulphite. The quantities of chlorine to be handled are therefore much larger. The concentration of chlorine and chlorinated products in the pulp is much greater and the effect of the higher concentration is a more corrosive action on the equipment. Wood reactors and wood piping for unwashed chlorinated stock have only a very short life and must be replaced with more resistant materials.

The quality of the finished product obtainable with a two stage process is very sensitive to the degree to which the chlorination is carried. Increasing the degree of chlorination progressively increases the strength of the bleached pulp. As the degree of chlorination increases the period for exhaustion of the chlorine increases. It becomes necessary to add lime before exhaustion is complete, otherwise the excessive period of acid chlorination will unfavorably counteract the effect of the increased degree of chlorination. The chlorination period should not exceed about 30 minutes. On the addition of lime the excess available chlorine is converted to hypochlorite. While a portion of this hypochlorite is consumed in reaction with dissolved compounds a major portion exerts a favorable bleaching action on the pulp. In this respect kraft is unlike sulphite. The chlorine reaction period may be reduced to 5 minutes and the subsequent hypochlorite reaction period increased to 60 or 90 minutes. After which the pulp is washed and given the second stage bleach. Under these conditions of operation the strongest pulps are obtained when the degree of chlorination is such that only about 10 to 20 pounds of available chlorine per ton are required in the second stage.

It is evident that under these conditions lime cannot advantageously be eliminated from the chlorination stage of a two stage operation. The situation may be different in a process involving more than two stages.

Trends in the Shift from Sulphite to Bleached Kraft

The development of processes for the bleaching of kraft has already set up a trend in the shift from sulphite to bleached kraft in some grades of paper. Semi-bleached krafts are being substituted for unbleached sulphite for the manufacture of bag, wrappings, etc., especially butchers' wrappers. The kraft products are stronger, cleaner and brighter in color.

The moderately full bleached kraft pulps are being substituted for bleached sulphite in the production of the lighter shades of bags and special wrappings and drug bonds. The advantage is greater strength.

High white krafts of superior strength are now available from both foreign and domestic mills. These are being substituted to some extent for bleached sulphite in specialty products but are also finding application in products for which sulphite has not been adequate, e.g. bags for sugar, flour, etc., formerly made of cotton.

Modernized Coating Equipment*

By Frank W. Egan[1]

In the paper coating industry years ago, coating paper merely meant getting clay coating onto the surface of a paper in any manner. Today that operation has become a science. Paper is coated so as to furnish a mineral surface on which to print.

Printing plants have carried forward new developments and a good deal of research work, with the result that today printing machines are heavily constructed and the printing units are equipped with micrometer adjustments and controls so as to obtain the best printing results. It therefore follows that the surface upon which the ink is applied has a great bearing on the quality of printing obtained.

The coated paper industry is keeping in step with these new developments, with the result that today we find constant tension unroll stands on coating machines whereby the tension on the web remains constant, regardless of the diameter of the roll, and it is automatically maintained.

In the coating machine we find heavily constructed frames and rolls supported in ball bearings. The coating head is driven through a tie with the rubber apron so as to provide for a uniform coating. The bed of the machine is arched, permitting the paper to lay smoothly on the bed when the coating is being brushed out. A machine of this type has all the advantages of the incline coater where a sufficient number of brushes can be mounted to obtain a good finish. The brush rod holders are supported in "V" type bearings so that clearance due to wear can be taken up readily and spring cushion stops are mounted on each end of the brush rod holder. The eccentrics are equipped with ball bearings and toggle joints for dampening the vibration to a minimum. The driving arms are carried well into the brush rod holders so as to obtain a straight line motion, eliminating the lifting of the brush from the bed.

Application of Coating Materials

On the coating application unit we find manufacturers using metal stocks for their round brushes instead of wood

* Presented at the meeting of the Kalamazoo Valley Section of the Technical Association of the Pulp and Paper Industry, Park-American Hotel, Kalamazoo, Mich., May 2, 1935.

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stocks. To my way of thinking, the best type of application is through a roll, which permits the applying of the coating over the entire width of the web and then a series of blending brushes to finish the application, and by roll application I mean the use of a chilled iron roll unit where the coating can be metered. This is an improvement over the older method where a felt covered roll was used and sometimes a felt blanket. The difficulty with the felt roll or blanket was that they were hard to clean. New types of agitators are being used in the color pan with a flow through feed from the service tanks, all to keep a uniformity in the coating mix as it is fed to the coating machine. In some mills they have the first brush mounted on the head roll, and this brush may be stationary or driven. In driving this brush the coating has a tendency to be carried to the under side of the paper. However, this can be overcome to a great extent by providing guards between the round brush and the head roll, and carrying these guards in over the edge of the paper. Six brushes are mounted on the arch bed and the brushes are assembled in nests of two with the length and speed of the stroke carefully worked out to a predetermined brush wave, and this brush wave has a definite relation to the speed of the machine. Once this is set the machine can be speeded up without effecting the brushing operation.

Drying and Finishing

Better types of suction units are being used. In some cases these are longer with less suction, and then felt perforated blankets are found in place of perforated rubber aprons, thereby permitting the sheet to have somewhat of a slip to take care of expansion wrinkles.

On the festooning machine we have always found that we were handicapped from a speed angle at the incline and also the take down end. The real value of a festooning machine, as we all know, is the time element, that it provides in slowly drying the paper, and this time element permits the use of low temperature air.

A number of improvements are found in the festooning machine; for instance, the use of a straight entering section in place of the incline with sticks on larger centres, and gradually closing them up as the paper is carried back into the festooning machine. The drives on the festooning machine are equipped for smooth running through the use of tracks to carry the drive chains. The racks are of all metal providing low maintenance. The turnarounds used are made up of roll steel turns with machine cut sprockets and a finished chain. The take down section is also of the straight type. In this section the sticks are spaced on larger centres in two or more steps and then the web is carried to the winder.

In the drying of the paper on the festooning machine a reflex type of drying system is producing excellent results. This method of drying uses the injector principles. Supply mains are carried along the side of the festooning machine with air nozzles spaced at stated intervals that delivers the air to the festooning machine in a horizontal plane. The nozzle action draws air from the room and projects it against the curved deflector plate mounted directly above the festooning machine. This sets up a low temperature, low velocity, air movement through the festoons. The recirculating and exhaust ducts are either mounted on the floor where conditions permit, or directly above the supply mains. In a good many mills today we find air systems automatically controlled so as to prevent over-drying of the paper, as well as to bring the paper to the winder with the right moisture content.

On the winder end we find heavily constructed equipment with rolls set in ball bearings. Some mills prefer winders of the centre wind type, whereas others lean toward the drum winder, either single or double. On the arch, in place of rods, rolls set in ball bearings are used. A standard series of tensioning rolls are used, and where centre winders are preferred we find pulling rolls geared together and driven, nested up in either a series of two or three rolls with a slip gear on one of the rolls so as to provide for a tight draw.

Work of TAPPI Coating Committee

The Coating Committee of the Technical Association has laid out a program that takes in a complete study of the mixing room, coating room and finishing room. At the present time we are completing our study of the mixing room. To help make this data complete we have prepared a questionaire that was sent out to coating men. A good many have filled in this questionaire and their answers have been most interesting. For instance, let us quote a question under the heading of "Mineral or Casein." The question was—"What is your mixing time?" The answers varied from 40 minutes to 5 hours. So you see there is a good deal of diversified opinions as to the method that should be used. We would be pleased if you would take one of these questionaires and fill it out and for your efforts we will be glad to send you a collated report of all answers received from coating men, to this series of questions. The names of individuals and all Companies are omitted from this report for obvious reasons. The more cooperation we can get along these lines the better it will be for all of us, for united efforts mean advancement, and where the doors are closed improvements in methods are retarded.

Your Committee has been very well pleased with the cooperation we have received from coating men throughout the paper industry, for they have sent us data on their methods of mixing and coating. Of course, new ideas or special developments are not mentioned, but what we are trying to do is to improve our every day routine.

It was only a few years ago that the Coating Committee was formed and a great deal has been accomplished in the investigation of equipment used in the mixing and application of coating, and this collection of data is available to all of our members.

I want to say here that the advancement that we have made and the splendid results that we are obtaining are due to the program and efforts that have been put forth by James J. O'Connor of the Mead Corporation, Chairman of the Coating Committee and he has relied to a great extent upon H. M. Annis of the Allied Paper Mills, who has given a great deal of his time and the benefit of his experience to improve the methods of coating and to add to the fund of knowledge that we have.

The coated paper industry is one of the sinews that form the backbone of the paper industry, for the best type of printing depends on it for a quality paper.

Argentina To Import Less Paper

WASHINGTON, D. C., October 30, 1935—It is becoming increasingly evident that the Argentine paper industry is gradually extending its influence to the prejudice of imported materials. Considerable quantities of wrapping paper and ordinary printing paper are now being made locally, and domestically produced writing paper is also available. The printing and wrapping paper seem to be of relatively good quality, but so far the cardboard is cheap. It is anticipated, however, that developments along this line will be pursued, and that ultimately a product comparable to imported cardboard will be produced. Estimates based upon published ship's manifests indicate that during the month of August imports of wrapping paper amounted to some 375 short tons.

The Morphology of Cellulose Fibers as Related to the Manufacture of Paper*

By Geo. J. Ritter[1]

Abstract

The morphology of cellulose fibers as depicted by different research workers is described.

Both generally accepted and controversial views regarding the morphology and some of the attendant physical properties of fibers are briefly discussed. Among them are the interpretations of published results regarding (1) fiber substructures isolated by chemical means: layers, fibrils, fusiforms, spherical units, ellipsoids, dermatosomes, crystallites, and primary-valence chain; (2) unit cell of the crystal lattice of cellulose; (3) chemical nature of the interfibrillar material; (4) nature of the interfiber bonds in paper; (5) internal and external shrinking and swelling of fibers; (6) effect of previous chemical and mechanical treatments on the chemical dissection of fibers; and (7) the effect of beating on some of the physical properties of fibers.

Shape and structure are important properties to be considered in the evaluation of cellulose fibers for papermaking. Accordingly, the more that is learned about the shape and structure and the attendant properties of fibers the greater will be the probability of improving and developing paper products. This paper discusses some of the fundamental morphological properties of fibers in relation to their influence on papermaking.

Size and Shape of Fibers

Cellulose fibers that are utilized for paper are slender capsular-shaped bodies. The average length of cotton, flax, and hemp fibers is about 35 mm., which is approximately 1,200 times their average diameters; the average length of hardwood fibers is 1 mm.; that of softwood fibers 3 mm. In general, the length of wood fibers is about 100 times their respective diameters. Straw pulp is composed principally of bast fibers, the average length of which is about 100 times their average diameters. They are very slender with pointed ends; their walls are drawn together at irregular intervals, giving the appearance of joints. Intermixed with the bast fibers are epidermal cells having serrated edges and also pith cells having smooth thin walls. Those from the pith vary from round to oval shape.

Fibers from different sources differ from one another, not only in size but also with respect to shape and other characteristics. As a result of these differences the fibers in papers and pulps containing fibers from two or more of most of the raw materials can be identified microscopically. For example, it is possible to distinguish among the fibers from cotton, flax, hemp, straws, cornstalks, bagasse, hardwoods, and softwoods. However, due to the similarity of the fiber characteristics it is difficult to identify mixtures of hardwood fibers or softwood fibers when they are present in the same pulp.

Cellulose fibers of various shapes and markings are present in a single paper-making raw material. Especially in wood, the type of fiber seems to depend on the season during which it develops and also on its function in the raw material. Some fibers gradually taper to pointed ends; some have rounded ends; and others are exceedingly blunt (Figs. 1, 2, 3). Some fibers are thick-walled with slender cavities and others are thin-walled with large cavities (Fig. 4). Those with thin walls develop during the early growing season when the moisture in the soil is plentiful; those with thick walls, in the latter part of the growing season when the soil moisture is less plentiful. They are, accordingly, named springwood fibers and summerwood fibers, repectively. In chemical pulps the springwood fibers generally collapse into ribbon-like structures, whereas those of the summerwood remain inflated. Springwood fibers tend to impart flexibility to the paper sheet; those from summerwood produce a stiffness, as has been observed by the Forest Products Laboratory and demonstrated by Nilsson *(13)*, who compared test sheets made from both springwood and summerwood pulps.

In the radial direction springwood fibers are about twice as broad as adjacent summerwood fibers. The walls of springwood fibers are more abundantly provided with pits than are summerwood fibers. As a result, springwood fibers are weaker than those in summerwood. Nilsson *(13)* has shown that pulp fibers from springwood are more easily ruptured and frayed in the pulp beater than are those from summerwood. In addition to the pits, the cell wall of wood fibers is characterized by promiscuously spaced cross markings which result from slip planes between the cellulosic microstructural units. These markings produce a weakened condition in the wall structure. Such weakened places in the wall are more readily attacked and dissolved by cellulose solvents than the intermediate portions. Hence treatment of fibers with cellulose solvents, under properly controlled conditions, results in the segmentation of fibers into cross sections. Except for their slightly frayed ends they resemble cross sections cut by mechanical means.

Cotton and Manila hemp fibers are likewise characterized by microscopically visible slip planes arranged more or less at right angles to the long fiber axis. As a result of the weakened places at the markings, these fibers are also dissectible into cross sections by chemical means.

Flax and hemp fibers, on the contrary, contain knotlike markings in which the slender microstructural cellulose units appear to bend in the form of a tiny whorl called a knot. To the author's knowledge little is known concerning the relative resistance of these knots and the intermediate segments of the cell wall to cellulose solvents. It would seem that the whorls would form a loose, weakened structure.

It is common knowledge that fibers from cotton, flax, and hemp are too long for the formation of uniform sheets on a paper machine. Consequently, they require processing to shorten them previous to their being utilized in pulps, on the other hand, is suitable for sheet formation. They are processed principally for improving strength properties.

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Microstructure of Fibers

Before describing the various substructural units that have been reported in the literature it is important to refer to the views of Bailey and Kerr *(1)* on the reported substructures of the cell wall. They have examined a large number of tropical woods and have found a decided variation in the cell wall among different species of woods. For instance, both concentric and radical stratifications were found, the first type of arrangement having been reported by a large number of workers and the latter by Dadswell *(5)*. They conclude that only a small number of woods have fibers containing concentric sleeves; further, they contend that all the microstructures smaller than the sleeves are shredded particles from a continuous cellulose matrix. Their conclusion is based on the observation that no cleavage planes suggesting the fiber substructures in question are microscopically discernible. They seem to have failed to consider that the discontinuities between the minute substructures are naturally below the resolving power of the microscope until after the bonds of the interfaces are broken by chemical and mechanical means.

Contrary to the views of Bailey and Kerr, cellular microstructural units have been isolated and photographed. They are believed to be units rather than fortuitous particles because they are rather uniform in size and shape and they separate from one another when the fibers are treated according to a well-controlled procedure. In various published reports they have been classified under the following headings: cell-wall layers or sleeves, fibrils, fusiforms, spherical units, ellipsoids, and dermatosomes.

Cell-wall Layers

Rarely in woods of the United States are cell-wall layers distinguishable before the fiber has been subjected to rather drastic alternate treatment with acids and alkalies. During these treatments some of the hemi-celluloses are dissolved and the fiber undergoes swelling and shrinking if the proper amounts of acids and alkalies are employed. As a result of these manipulations, a number of concentric layers or sleeves comparable in arrangement to those in onions may become visible in cross sections of the fiber. On a longitudinal surface of the fiber the layers appear as lines paralleling the outer and the inner longitudinal boundaries of the cell wall (Fig. 5). In reality, those sleeves are thin-walled capsular bodies concentrically arranged. As a result of that arrangement the sleeves cannot be separated readily, even though they have been loosened from one another. Separation can best be accomplished in fiber segments cut to expose open ends so as to allow telescoping movement of the sleeve segments (Fig. 6), or cut longitudinally through the lumen to expose trough-shaped segments.

The number of sleeves in the cell wall apparently varies from fiber to fiber and also with the thickness of the walls. The author has noted as many as twelve in some fibers, and even more have been reported by Scarth (*17*). To distinguish them requires a replacement of hemicellulosic materials between them with aqueous solutions having an index of refraction differing from that of the sleeves. The next succeeding smaller unit into which the fiber can be dissected is a slender cellulosic filament called the fibril.

Fibrils

Although the different cell-wall layers of normal wood fibers appear as homogeneous sleeves, they nevertheless are composed of compactly wound cellulosic filaments, named fibrils. A smooth sleeve results from a filling of any interstices between the fibrils with hemicellulosic material which in normal fibers must be removed before the fibril windings become discernible. In the outer layer of the cell wall the windings are arranged at approximately right angles to the fiber axis (Fig. 7). That the striations shown in Fig. 7 result from the windings of filaments rather than a wrinkling of a homogeneous sheath is demonstrated in Fig. 8 in which the helical structure is proved beyond a doubt. This finding is contrary to the explanation suggested by Trogus *(23)*, who apparently failed to discover the fibril structure of the outer sheath. Unlike the fibril arrangement of the outer sheath, that of the remaining sleeves of the secondary cell wall of normal wood fibers is from 5 to 30 degrees to the long fiber axis (Fig. 9).

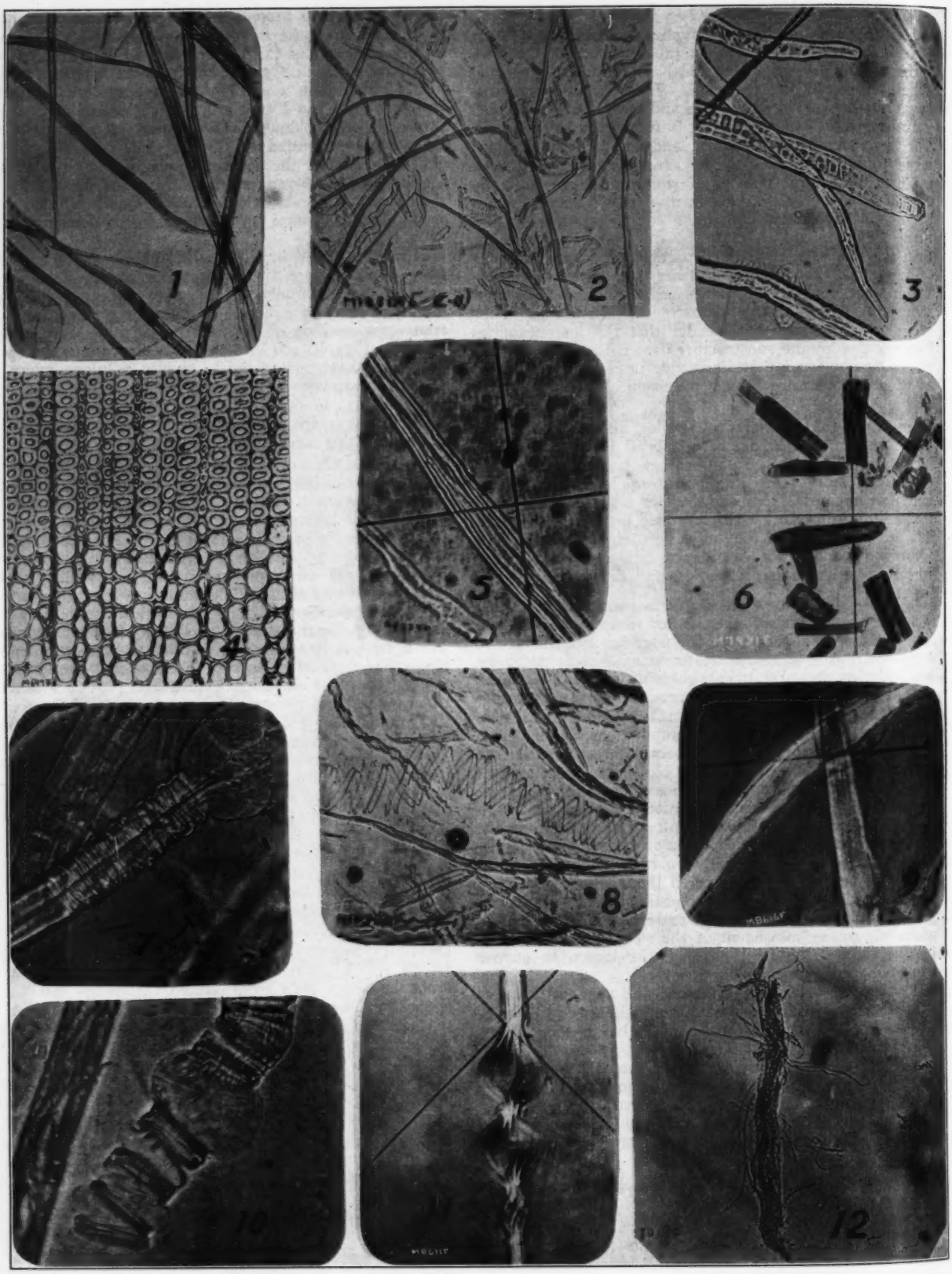
It may be noted in Fig. 7 that intense swelling of the fiber occurs where the outer layer has been removed, making the remainder of the fiber appear constricted. This phenomenon indicates that the outer layer restricts transverse swelling of the fiber. The same is well illustrated in Figs. 10 and 11. In these illustrations the swelling agents have forced the secondary cellulose layers between the windings of the outer sleeve, rolling them over one another. In this manner there may be formed short constrictions which are wrapped by several thicknesses of the constricting sleeve.

In spite of the drastically swollen condition, the secondary sleeves can be traced through the constricted and the beaded segments (Fig. 11). These results indicate that the cell-wall layers have no transections, which is contrary to the views of Lüdtke *(11)* and Lewis *(10)*, who contend that the fiber is segmented at short intervals by cross walls which prevent transverse swelling of the fiber at the cross walls. The absence of cross walls may be further demonstrated by mechanically rupturing the constricting sheath between two of the beaded segments. When that is done the two beads are converted into a single large spheroid having no transverse breaks in its wall. Still other additional evidence to prove the absence of cross walls is presented in the form of fibril sections 230 microns long from the secondary layers (Figs. 12 and 13). These dimensions are approximately six times the average distance (40 microns) between the cross walls according to Lüdtke.

Fibril segments of 230 microns are only short portions of the units. The difficulties encountered in isolating the entirely intact fibrils, however, are not due to intersections with cross walls but rather to the fragility of the filaments. Consequently, the mechanical force required to separate them, even after loosened by chemical means, is in many cases sufficient to break the slender structures.

Fibrils are loosened from fibers during the beating of chemically prepared pulp but before they separate other effects which improve the strength of the paper made from the beaten pulp are produced. Although the effects continue to increase concurrently, after a certain stage is reached in the beating process, they generally begin development in the following order: increase in the pliability of the fibers, transverse cutting of the fibers, gelatinization of fiber surface, rupturing of outer layer, fibrillation, and increase of translucency. This order of development may differ depending on the method of operating the beater.

An increase in fiber pliability is considered advantageous in obtaining a suitable formation of paper because it increases the number of fiber-fiber contacts, thereby increasing the density and strength of the paper. As reported by Doughty *(6)*, transverse cutting or shortening of the fiber generally aids in the formation of more compact sheets and likewise increases the number of fiber-fiber contacts. An exception, of course, is the result obtained by the quick cutting process of producing blotting



For Descriptions of Photomicrographs See Opposite Page

and book papers. By this procedure fibrillation is kept at a minimum and increase in flexibility is not increased to any marked degree. Gelatinization of fiber surface is produced by the initial loosening of the interfibrillar material on the fiber surface. Rupturing of the outer layer exposes the fibrils of the inner sleeves to the beating action which produces "brooming" of the fibers, thereby improving felting during sheet formation on the fourdrinier (Fig. 14). This stage of beating tremendously increases the number of fiber-fiber contacts.

It is obvious that an increase in the number of fiber-fiber contacts without destroying the gross fiber structure is essential for improving the strength properties of the sheet. This is indicated by observations made by Simmonds and Baird *(19)*, who used rubber balls as processing elements. On the other hand, too prolonged beating will greatly reduce the fibers, producing an oversupply of short segments at the expense of the gross fiber structure. As a result, the increased number of fiber segments requires a greater number of fiber-fiber contacts. Since the mechanically made bonds are weaker than those within the fiber structure, as is demonstrated by their greater reactivity to moisture, sheets made from overbeaten pulp are therefore weaker than those made from pulp beaten the optimum time.

Papers having a high degree of opacity contain both interfiber and intrafiber (cell cavity) voids. Prolonged beating tends to eliminate the interfiber voids in sheets through the utilization of the finely divided cellulosic particles as a filler. It excludes the intrafiber voids or cell cavities also by destroying the gross fiber structure. As the voids are gradually excluded the paper becomes more and more translucent because fewer randomly arranged fiber-air interfaces remain for interference with the normal transmission of light through the paper.

The mechanism of the forces operating in the fiber-fiber bonds is a moot question. Strachan *(21)*, Mark *(12)*, Harrison *(8)*, and others believe that the tenacity of the bond is a cementing force produced by dehydrating the gelatinized surfaces of the more or less intact fibers and fibrils. This explanation requires no agreement in the alignment of the cellulosic particles in the two adjacent surfaces. Campbell *(3)*, on the other hand, contends that the holding power is the result of crystallographic forces developed during the dehydration of the bonds. His concept of the force in the bond necessitates a preferred rearrangement of the cellulosic crystals to take place in the two gelatinized surfaces as dehydration proceeds. Both schools of thought agree that a cohesive force manifests itself when the water is evaporated from the gelatinized surfaces. It then seems that the main difference regarding the nature of the bonds is one of terminology. As yet there is a scarcity of data to prove whether the cellulose particles of the bonds are randomly arranged as characteristic of a cementing force or regularly aligned according to some crystallographic system.

As has been shown, the loose ends of fibrils play a role in the felting properties of paper sheets. If fibers are properly treated *(14)* long fibril segments are isolated (Fig. 15). Their full length is by no means measurable from the photomicrographs since the slender filaments have been broken into short sections during the isolation procedure.

Description of Photomicrographs

(See opposite page for illustration)

FIG. 1. Delignified cellulose fibers having pointed ends.
FIG. 2. Delignified cellulose fibers having ends of various shapes.
FIG. 3. Delignified cellulose fibers having rounded and blunt ends.
FIG. 4. Transverse sections of springwood and summerwood fibers.
FIG. 5. Delignified wood fibers, the layers of which have been loosened from one another.
FIG. 6. Sections of delignified wood fibers the cell-wall layers of which have been partially separated by slipping them endwise.
FIG. 7. Windings of the fibrils of the outer layer of a wood fiber showing the extreme transverse swelling of the remainder of the cell wall from which the outer layer has been removed.
FIG. 8. Outer layer removed from a delignified spruce wood fiber and stretched slightly endwise.
FIG. 9. Partially loosened fibrils of the inner layers of a delignified elm fiber.
FIG. 10. Windings of the outer layer of an incompletely delignified spruce fiber pushed apart by the extreme swelling of the inner layers.
Fig. 11. Shows the uninterrupted longitudinal structure of the individual layers of the secondary cell wall.
FIG. 12. Section of a delignified pine fiber in a fibrillose condition.

FUSIFORMS

Under closely controlled conditions *(14)* fibrils have been dissected into slender spindle-shaped structures which have been named fusiforms (Fig. 16). Before their separation these structures are arranged with their pointed ends overlapping to build up the fibrils.

SPHERICAL UNITS

Fusiforms from wood *(15)* are composed of tiny units which assume a spherical shape when they separate from one another (Fig. 17). As near as can be measured, the spherical units range from 0.2 to 0.4 microns in diameter as isolated in an extremely swollen condition. Although they are spherical in shape when isolated, they nevertheless must be ellipsoidal or oblong in the fusiforms as is shown by the contrast in the optical properties of the two types of structural units. In polarized light they manifest random arrangement of their crystalites, whereas the fusiforms manifest parallel arrangement of their crystallites. The contrast can be explained on the basis of a change from preferred to random orientation of the crystallites in the spherical units during the isolation process. That is highly probable because the procedure involves intense swelling of the cellulose particles.

ELLIPSOIDS

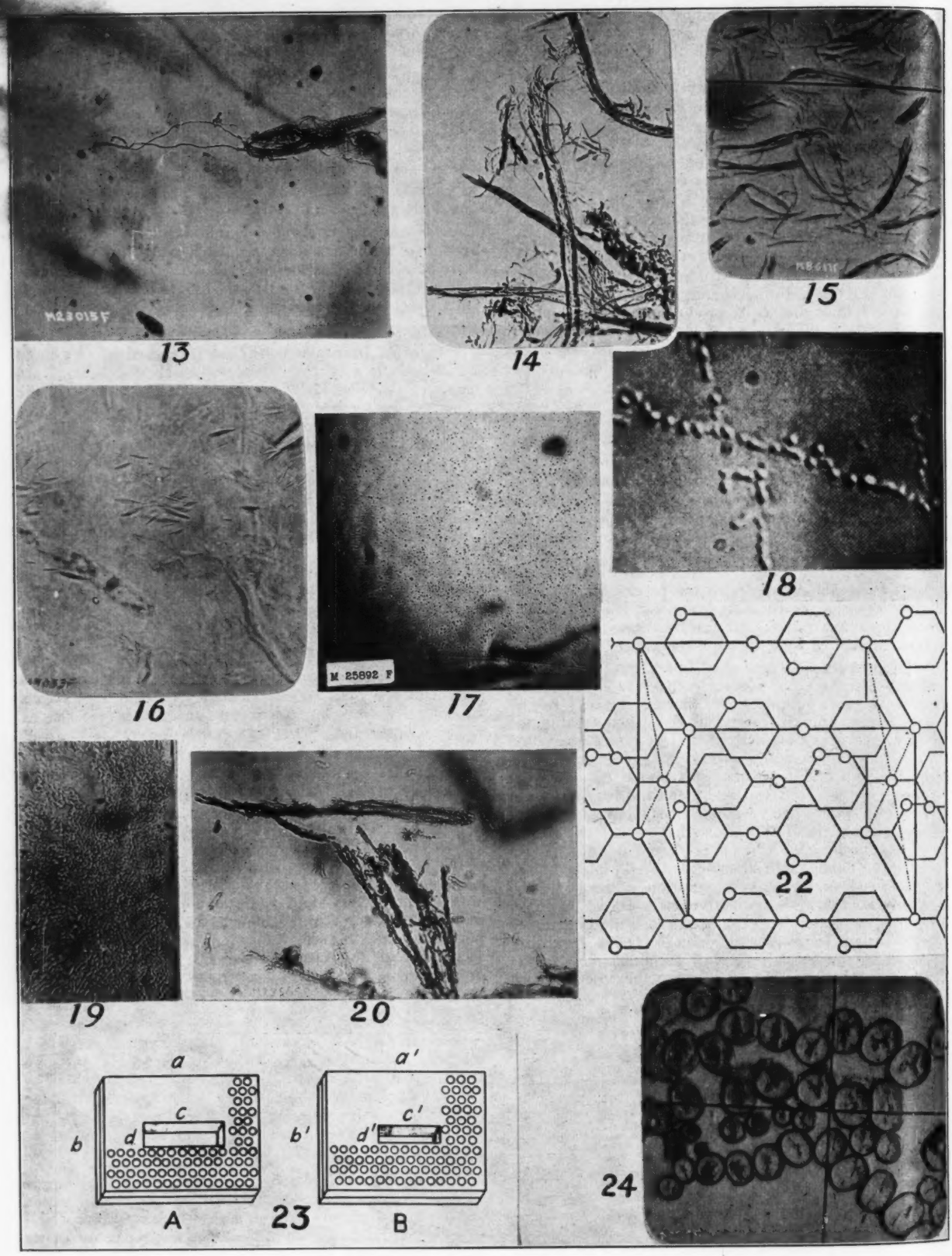
Farr *(7)* has succeeded in isolating ellipsoidal units from cotton fibers (Fig. 18). They are 1.0 by 1.5 microns in size, being three and one-half to seven times the size of the spherical units. They are doubly refractive to light, in which respect they are comparable to the fusiforms, although they are thicker and shorter than the drastically swollen fusiforms. Having been found in the cytoplasm in the developing cotton fibers they should be at their natural water-saturated size. On the contrary, the fusiforms and the spherical units from wood when isolated are in an extremely swollen condition, being at least 100 percent or more greater than their normal size. The author appreciates that such minute measurements are difficult to make. Taking the thickness dimension, as reported, of the ellipsoids in a water-saturated condition, it seems difficult to reconcile it with the thickness of fibrils or even the cell-wall sleeves as reported by other research workers.

DERMATOSOMES

Wiesner *(24)*, by means of heated hydrochloric acid solution, has broken down cellulose fibers into dust-like particles which he believes are microstructural units (Fig. 19). He has named the particles dermatosomes. So far the author of this paper has not convinced himself that these are actual structural units.

SUPERMICELLES

Seifriz *(18)* and Thiesen *(22)* claim to have discovered by means of the Spierer lens a microstructural unit which has not been isolated. The unit has been named supermicelle by Seifriz and micelle by Thiesen on account of its shape, resembling that of the micelle postulated from X-ray data. On the contrary, Ritter *(16)* and Clifford



For Descriptions of Photomicrographs and Diagrams See Opposite Page

and Cameron *(4)* believe the supermicelles are nothing more than diffraction bands.

Ash Residue

The microscopically visible units described above are principally organic or cellulosic in composition. If the fibers are burned rather than dissected, an inorganic residue or ash is left. Even though the ash constitutes only a fraction of 1 per cent of the fiber, it still forms a continuous structure which represents a skeleton of the fiber (Fig. 20). No definite conclusions have been reached regarding the combination of the ash in the untreated fibers.

Submicrostructure of Fibers

Micelles or Crystallites

Structural units below the resolving power of the microscope have been conceived from X-ray data. The largest of these has been named micelle or crystallite. In shape it is believed to be a rectangular parallelopiped, being approximately 50 by 50 by 500 to 1000 Angstrom units in size (Fig. 21). The micelles are supposedly held together by tertiary valence forces. Whether other physical structures exist intermediate to the spherical units and crystallites is not known.

Primary Valence Chains

Primary valence chains are substructures of the micelles. They are long, slender structures, being from 500 to 1000 Angstrom units in length (Fig. 21). They are composed of anhydroglucose residues attached through an oxygen bridge between carbon 1 of one sugar residue and carbon 4 of the succeeding sugar residue. The primary valence chains are held together by secondary valences to form the rectangular bundles, micelles or crystallites.

Unit Cell

The unit cell is a regularly occurring unit diagram in the crystal lattice. It involves the glucose residues of the primary valence chains, comprising the equivalent of four anhydroglucose residues—two whole residues and eight quarter residues (Fig. 22). Unlike the foregoing structural units, which are composed of one or more whole physical structures, the unit cell is a theoretical reoccurring spacing which includes both whole and fractional parts of physical structures. Its dimensions, which are 7.8 by 8.3 by 10.3 Angstrom units, are calculated from X-ray diffraction data.

Physical Properties of Cellulose Fibers

Shrinking and Swelling

It is a well-known experimental fact that the sorption of water by wood below fiber saturation causes shrinking and swelling. Likewise chemically isolated cellulose fibers manifest similar properties. These volume fluctuations are caused by the sorption of water in the interstices between the various structural cellulose units even as small as the crystallites. The measurement of the moisture-volume relation of wood and isolated fibers is complicated by the fact that a part of the change in volume is internal. The internal volume changes are difficult to determine because they involve dimensional measurements of the lumen and the intercellular spaces. Direct measurements of the lumen before and after sorption of water can be made on fibers of properly selected cross-sectional shape, but those of the intercellular spaces are hopelessly complicated. Fortunately, the effect of the intercellular spaces can be minimized by utilizing wood sections involving very few of these cavities, and better still, it can be eliminated entirely by choosing isolated fibers.

An approximate measurement of the changes in the volume of fibers is simplified by considering their lengthwise behavior when water is sorbed. Repeated measurements reveal that the fluctuation in the longitudinal dimension of wood and isolated fibers is only a fraction of 1.0 per cent. Wood blocks are prone to increase slightly and isolated fibers to decrease slightly lengthwise when water is absorbed. This contrast in behavior as exhibited by wood and isolated fibers is explainable in that the long axis of all the fibers is not parallel with that of the wood. Consequently, if the transverse swelling of the nonparallel fibers is resolved into its two components, a slight longitudinal swelling occurs even in small wood sections. Also a swelling of the wood rays tends to increase the longitudinal dimensions of wood. Since the longitudinal fluctuation of isolated fibers is so slight, it is necessary to consider only the cross-sectional measurements in approximating the volumetric swelling. Such a procedure will result in volumetric swelling values that are slightly low for wood and slightly high for fibers.

It is on the basis of omitting the longitudinal measurement that the internal and external swelling of partially delignified fibers was approximated. The results were collected microscopically several years ago. Although limited in scope, they positively reveal that the internal swelling is considerable and varies from fiber to fiber.

Cross sections of spruce wood 25 microns thick were partially delignified. The cross sections of fibers were still attached at irregular intervals so as to keep them from falling apart. The sections were placed on microscope slides and oven dried. Days having low relative humidities were chosen for making the microscopical measurements of the dry cross sections. Next water was allowed to flow over the sections and the dimensions of the water-soaked material were again measured.

Data for approximating the percentage of swelling consisted of the external dimensions and the lumen dimensions of the dry wood cross section, the external dimensions and the lumen dimensions of the water-soaked wood cross sections. (Fig. 23.)

Calculations of the swelling were made according to the following formulas:

$$(a \times b) - (c \times d) = \text{dry volume of wood}$$

$$(a' \times b') - (c' \times d') = \text{wet volume of wood}$$

$$\frac{[\text{Wet volume} - \text{dry volume}] \times 100}{\text{Dry volume of wood}} = \text{Per cent total swelling}$$

$$\frac{[(c \times d) - (c' \times d')] \times 100}{\text{Dry volume of wood}} = \text{Per cent internal swelling}$$

$$\frac{[(a' \times b') - (a \times b)] \times 100}{\text{Dry volume of wood}} = \text{Per cent external swelling}$$

Calculations from the foregoing formulas indicate that the total volumetric swelling based on the dry volume ranges from 38.0 to 46.5 per cent, the external swelling

Description of Photomicrographs and Diagrams

(See opposite page for illustrations)

Fig. 13. Section of delignified pine fiber from which a long fibril section has been teased.

Fig. 14. Fibers showing different stages of fibrillation.

Fig. 15. Fibrils isolated from delignified wood fibers.

Fig. 16. Fusiforms isolated from delignified spruce fibers.

Fig. 17. Spherical units isolated from delignified spruce fibers.

Fig. 18. Ellipsoids isolated from cotton (according to Farr).

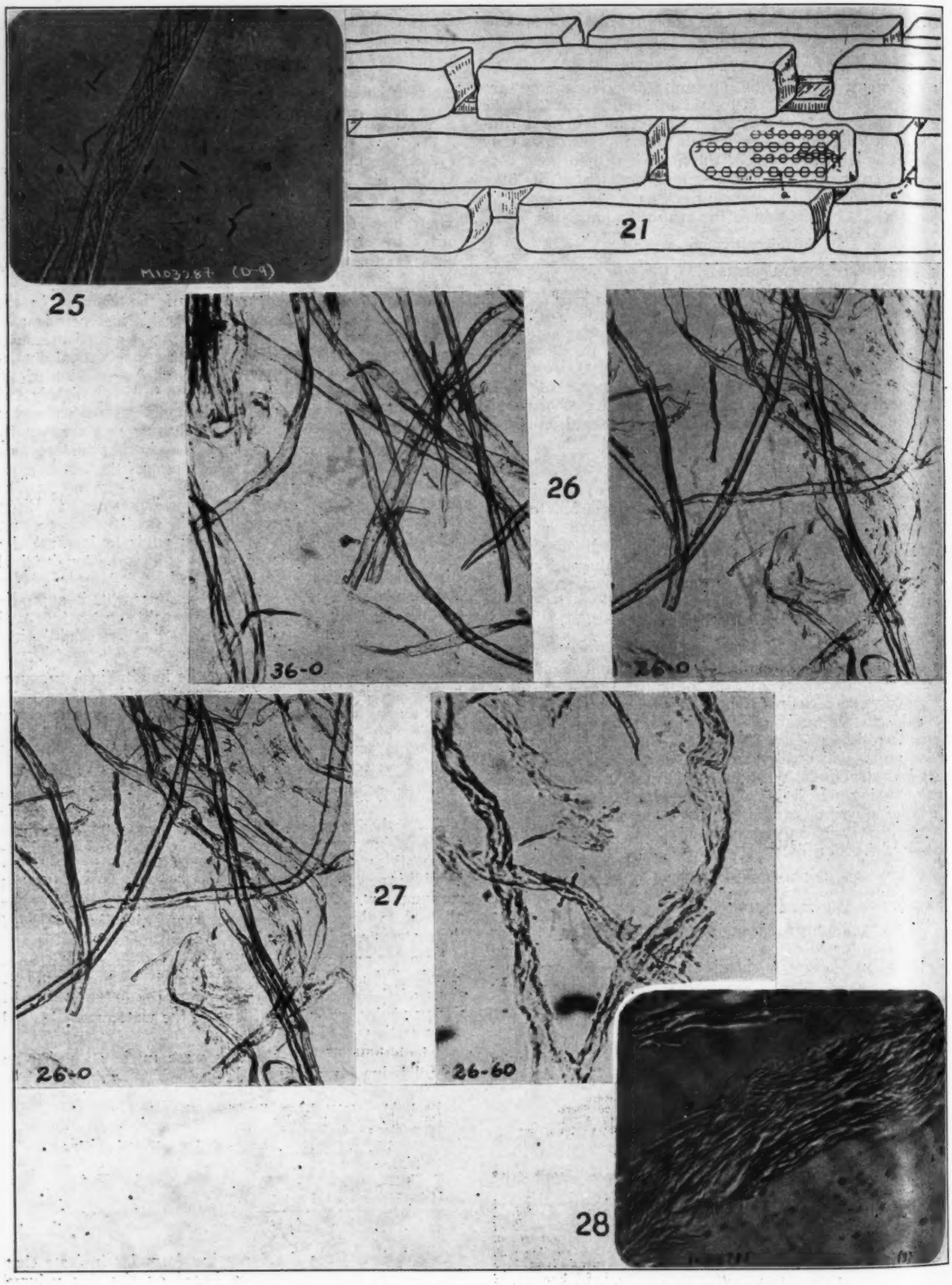
Fig. 19. Dermatosomes isolated from delignified fibers (according to Wiesner).

Fig. 20. Ash residue from wood fibers.

Fig. 22. Unit cell showing the arrangement of the glucose residues of the primary-valence chains (according to Clark).

Fig. 23. Diagram of transverse sections of wood. The arrangement of the fibrils in the outer layer is indicated by the horizontal lines and the arrangement of the fibrils in the remaining layers is indicated by the rows of circles which represent fibril cross sections. (a) Dry section; (b) wet section.

Fig. 24. Transverse sections of delignified wood fibers after swelling with dilute sodium hydroxide solution. Although the cross-sectional faces have become circular, the outer layer cannot stretch sufficiently to accommodate the outward swelling of the remainder of the cell wall. As a result a part of the cell wall is forced into the lumen.



For Descriptions of Photomicrographs and Diagrams See Opposite Page

ranges from 25.0 to 30.0 per cent, and the internal from 8.0 to 13.0 per cent. The lower values for the total percentage swelling can be explained on the basis of some moisture being absorbed before the measurements of the dry sections were completed.

The data further indicate that during drying the shrinkage of the outer sleeve, which in effect amounts to its longitudinal contraction, is insufficient to accommodate the crosswise contraction of the remainder of the cell wall. To compensate for the discrepancy, the tiers of fibrils adjacent the lumen are drawn outward, thereby increasing the size of the lumen and setting up a strain. When dry fibers absorb water, both internal and external swelling occur, restoring the lumen to its original size and thereby relieving the strain set up during drying.

Values for the internal swelling presented in this paper are greater than the calculated cross-sectional changes in the cell cavities of untreated wood sections reported by Stamm *(20)* and the changes given by Beiser *(2)*. Just what effect lignin ray cells and neighboring fibers have on swelling is unanswered from the available data. That question is, perhaps, beside the point for the paper manufacturer. He is, however, interested in the two types of swelling manifested by isolated fibers since both of them affect the density of the paper.

Internal swelling of an exaggerated type occurs when swelling agents, such as dilute sodium hydroxide and potassium hydroxide solutions, are employed. These reagents convert the angular-shaped fiber cross section to a ring. Even in the ring form the perimeter of the fiber is too short to accommodate the extremely swollen condition of the secondary cell wall. Unable to stretch the outer sleeve farther, the reagent forces the secondary cell wall into the lumen, therewith closing it entirely (Fig. 24).

Just why dilute alkaline solutions swell wood more than does water can be explained in several ways. The most probable explanation is that the alkaline solutions penetrate into interstices which are inaccessible to water as such. For example, Katz *(9)* has demonstrated that alkaline solutions permeate into the crystallites, whereas the smallest intersticial spaces into which water as such penetrates are those between the crystallites. Naturally, the increased number of voids involved will greatly increase the swelling. Then, too, the X-ray data indicate a change from parallel to random arrangement of the crystallites during swelling with alkalies, which would increase the transverse dimensions and decrease the longitudinal dimensions of the fibers.

Compression Fibers

Some fibers like some woods manifest abnormalities. A common irregularity affecting their physical appearance is known as compression. It consists of a more or less loose winding of the fibrils, making them distinguishable without the application of chemicals (Fig. 25). For some unknown condition, the fibrils are openly spaced with intervening checks which extend through the secondary thickening of the cell wall. In general, the fibril slope ranges from 30 to 40 degrees to the fiber axis. In cross sections of fibers the checks appear as radical ruptures extending from the lumen to the outer layer. Another characteristic of compression fibers is noticeable in untreated cross sections of wood. It is the abundance of intercellular spaces. They result from the rounded fiber corners which fail to bond with their neighbors. Due to the open structure of compression fibers, they are readily fibrillated by chemical means and should likewise disintegrate easily by mechanical means, such as the beater.

Resistance to Fibrillation

Other factors being the same, the resistance of fibers to fibrillation depends on the severity of their previous chemical and mechanical treatments. In other words, fibers from a pulp prepared by a drastic pulping process dissect more easily than those from a pulp prepared by a mild process (Fig. 26). Also the fibers from a pulp that has received drastic mechanical treatment dissect more readily than those in a pulp having received little mechanical processing (Fig. 27). These results are explainable on the basis that a greater percentage of the interfibrillar substance is loosened and removed by the more severe treatment than by the milder treatments. This explanation may seem contrary to the well-known experimental fact that alpha pulp is dissected and fibrillated with greater difficulty than a less purified pulp. That, however, occurs when the alpha pulp has been dried, allowing the modified cellulose materials to cement the fibrils together by a substance more resistant than that in the original fibers.

Much has been written about the interfibrillar substances but little definite information is available regarding its composition. It is hydrolyzed and dissolved in less concentrated acid and alkaline solutions than the major portion of the fibrils, which is composed of the more stable or longer primary-valence chains.

In wood, straw, and cornstalk fibers, it seems to consist of compounds consisting of uronic acids, pentosans, and hexosans. During fibril development it precipitates from the cytoplasm after the more insoluble longer-chained polysaccharides of anhydroglucose residues. If this view is tenable, then the more stable cellulose would form the fibril central core which would be insulated with the interfibrillar material. In cotton it might consist of anhydrouronic acids and anhydroglucose residues combined in the form of compounds of a lower molecular weight than the stable cellulose. Such an interfibrillar hemicellulosic material will exhibit the chemical and physical properties cited by Lüdtke *(11)* for a skin substance which he postulates as surrounding the various cellulose units.

An interfibrillar substance as just described would, for example, evolve carbon dioxide when heated with boiling hydorchloric acid. Physically it would form a continuous matrix between and surrounding at least the larger microstructural cellulose units. If its continuity were severed between the cellulose units by chemical and physical means, the units could be separated. Strong swelling agents would cause it to swell and stretch so as to accommodate the swelling action of the encased more stable cellulose particles.

Types of Dissection

Fibers dissect differently, depending on the severity of their previous chemical treatment. If they still contain the interfibrillar material and considerable lignin in the

Description of Photomicrographs and Diagrams

(See opposite page for illustrations)

Fig. 21. Micelles or crystallites of cellulose indicating the forces holding them together and showing the arrangement of the primary-valence chains in one of the micelles (according to Clark).

Fig. 25. A delignified isolated fiber from compression wood shows the large fibrillar angle.

Fig. 26. Shows the influence of previous chemical treatment on the dissection of fibers by chemical means. 36-0. Pulp prepared by a mild digestion, given no milling and then treated with chemical dissection agent. 26-0. Pulp prepared by a drastic digestion, given no milling and then treated with the same dissecting agent as pulp 36-0.

Fig. 27. Shows the effect of previous milling on the dissection of fibers by chemical means. Pulp 26-0 received no milling but the same pulp 26-60 received 60 minutes milling previous to the treatment with the dissecting agent. Note effect of milling on the subsequent dissecting treatment.

Fig. 28. Shows the type of dissection that results if a well delignified wood fiber is treated with a chemical dissecting agent. Contrast with figure 10 to see the effect of incomplete delignification.

outer sleeve, they dissect according to Fig. 10. On the contrary, if they have been well delignified during which some of the interfibrillar substance of the outer sleeve has also been removed, they dissect according to Fig. 28. In the first case the lignin retards solution of the outer layer, resulting in a beaded effect at irregular intervals where rupturing between the windings occurs. Many of the constrictions resist solution even on increasing the dissecting agent to a concentration that readily dissolves cellulose. In the second case, the outside layer dissolves uniformly, allowing the inner sleeves to fibrillate uniformly. As a source for rayon a pulp exhibiting the properties of the latter fiber would seem the more desirable because all of the lignin and much of the hemicelluloses have been removed.

Summary

Cellulose fibers are described from the standpoint of their morphology and its influence on their papermaking properties. Cotton, flax, and hemp fibers require processing for the development of both sheet formation and strength properties. Wood, straw, and cornstalk fibers require processing principally for developing strength properties.

Structural properties, both the micro and the submicro of the various kinds of fibers, with special emphasis on those of wood, are discussed. These properties and their attendant physical characteristics manifested by fibers in the manufacture of pulp and paper are described and illustrated by means of photomicrographs.

An interfibrillar material is discussed from both the chemical and the physical standpoint, together with its apparent effect on the behavior of fibers during the processing of pulp previous to the manufacture of paper.

Measurements of the internal and the external swelling of isolated wood fibers are given. They show that a substantial part of the swelling is internal.

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Berkshire Board Plant Sold

The Columbia Box Board Mills, Inc., Chatham, N. Y., has recently bought the plant at Mellenville, N. Y., formerly occupied by the Berkshire Paper Board Mills, Inc., to be called the Mellenville Division. The company has been operating in the plant about three weeks, after reconditioning and repairing. The mill had been idle for several years. Matthew ("Matty") J. Gray is president, treasurer and general manager of the Columbia Box Board Mills, Inc.

Graphic Arts Division Chooses Officers

The Graphic Arts Division of The American Society of Mechanical Engineers has held a meeting for the election of officers for the fiscal year beginning December 1, 1935. Edward Pierce Hulse, who has been secretary, is the new chairman. He succeeds Edward Epstean, chairman of the board of the Walker Engraving Company. Thomas E. Dalton, of International Magazines, is secretary. The other members of the Executive Committee are Burt D. Stevens, Edward Epstean, Joseph M. Farrell, and Ronald G. Macdonald, secretary of the Technical Association of the Pulp and Paper Industry, each filling a five-year term.

Honorable A. E. Giegengack, the Public Printer of the United States, has accepted as chairman of the Meetings and Programs Committee, with William Clement Glass as secretary. A new committee, on International Engineers, will have Edward Epstean as chairman and Arthur C. Jewett as secretary—this is to aid in banding the printing engineers of all nations. George H. Carter will head Research Coordination, the former Research and Survey Committee ending with the successful formation last October of the Graphic Arts Research Bureau.

Price Engineering, originating four years ago in the division with a tentative committee, now has suggested a program to be carried out by a committee with William L. Churchill as chairman and a representative group to assist in the work, including Prof. Walter Rautenstrauch. The Progress Report Committee has Winfield S. Huson as chairman, and the Paper and Pulp Committee is headed by William R. Maull. The Advisory Associates are Thomas R. Jones, Harry L. Gage, Summerfield Eney, Jr., Wells F. Harvey, V. Winfield Challenger, John Clyde Oswald, Harry M. Tillinghast, Hadar Ortman, F. M. Flynn, and William C. Huebner.

The Sixth Conference of the Technical Experts in the Printing Industry will be held in Washington about the middle of next May, together with the Second Meeting of the Graphic Arts Research Bureau, both sponsored by the A.S.M.E. division. The Public Printer of the United States will be the official host, with the International Craftsmen and the A.S.M.E. Local Section cooperating.

Effects of Fumigants on Paper

In R. P. 828 in the September number of the National Bureau of Standards Journal of Research, it is shown that the valuable records of the Government can be fumigated to rid them of book worms without danger of injury to the documents, according to recent findings at the National Bureau of Standards. Several commercially available fumigants, known to be deadly to destructive insects often associated with old books and documents, were found to be harmless to paper in a recent study. Hence, the Government can safely use these chemicals to rid valuable records of book worms before preserving them in its new model depository, the National Archives Building. In investigating the action of the gases used for killing insects, the Government scientists fumigated representative papers in a gas chamber at the Bureau of Entomology, in the Department of Agriculture, and determined the effects of each gas by chemical and physical tests of the papers. Hydrocyanic acid gas, carbon disulphide, ethylene chloride-carbon tetrachloride, ethylene oxide-carbon dioxide, and methyl formate were used without injury to the papers.

Separate copies of this article can be ordered from the Superintendent of Documents, Washington, D. C. (Price, 5 cents).

IMPORTS OF PAPER AND PAPER STOCK

NEW YORK, BOSTON, PHILADELPHIA AND OTHER PORTS

NEW YORK IMPORTS

WEEK ENDING OCTOBER 26, 1935

CIGARETTE PAPER

Standard Products Corp., Normandie, Havre, 7 cs.; Champagne Paper Corp., Normandie, Havre, 139 cs.; Champagne Paper Corp., Indep. Hall, St. Nazaire, 358 cs.; H. H. Strauss, Indep. Hall, Bordeaux, 414 cs.

WALL PAPER

———, Bremen, Bremen, 2 cs.

WALL BOARD

Treetex Corp., Hamburg, Hamburg, 2222 bdls.

NEWSPRINT

Bank of Montreal, Humberarm, Cornerbrook, 3036 rolls; N. Y. Evening Journal, Markland, Liverpool, N. S., 399 rolls; N. Y. Tribune, Markland, Liverpool, N. S., 2100 rolls; World Telegram, Markland, Liverpool, N. S., 639 rolls; Bridgeport Herald, Markland, Liverpool, N. S., 24 rolls; Brooklyn Daily Eagle, Markland, Liverpool, N. S., 493 rolls; Clinton Paper Corp., Markland, Liverpool, N. S., 587 rolls; ———, Hallaren, Norrkoeping, 148 rolls; Brooklyn Times, Hallaren, Norrkoeping, 321 rolls; Gilman Paper Co., Hallaren, Norrkoeping, 544 rolls; Jay Madden Corp., Scanyork, Kotka, 698 rolls; Dunham & Reeve, Inc., Scanyork, Kotka, 327 rolls; H. G. Craig Co., Inc., Donnacona, Montreal, 543 rolls; H. G. Craig Co., Inc., Donpaco, Donnacona, 295 rolls; Perkins Goodwin & Co., Hamburg, Hamburg, 310 rolls.

PRINTING PAPER

F. L. Kramer, American Farmer, London, 4 cs.; J. H. & G. B. Siebold, Inc., Hamburg, Hamburg, 21 cs.

WRAPPING PAPER

National Pulp & Paper Co., Inc., Consul Olsson, Gothenburg, 20 rolls.

PACKING PAPER

J. P. Heffernan Paper Co., Hamburg, Hamburg, 50 bls.

FILTER PAPER

H. Reeve Angel & Co., Inc., Normandie, Havre, 41 cs.; A. Giese & Son, Black Condor, Rotterdam, 5 cs.; C. Schleicher & Schull Co., Inc., Hamburg, Hamburg, 2 cs.

DRAWING PAPER

H. Reeve Angel & Co., Inc., American Farmer London, 2 cs.

SURFACE COATED PAPER

Gevaert Co., of America, Westernland Antwerp, 51 cs.; L. A. Consmiller, Hamburg, Hamburg, 8 cs.; C. Happel, Hamburg, 10 cs.

METAL COATED PAPER

K. Pauli Co., Hamburg, Hamburg, 10 cs.

BASIC PAPER

Dingelstedt & Co., Hamburg, Hamburg, 35 cs.

PHOTO PAPER

J. J. Gavin, Majestic, Southampton, 5 cs.; American Express Co., Hamburg, Hamburg, 50 cs.

DECALCOMANIA PAPER

B. F. Drakenfeld & Co., American Importer, Liverpool, 1 cs. (duplex); B. F. Drakenfeld & Co., American Importer, Liverpool, 1 cs. (simplex).

DECALCOMANIAS

Sellers Transportation Co., Bremen, Bremen, 8 cs.; Sellers Transportation Co., Hamburg, Hamburg, 34 cs.

TRANSFER PICTURES

Rohner Gehrig & Co., Bremen, Bremen, 7 cs.

TISSUE PAPER

W. J. Byrnes, Scythia, Liverpool, 1 cs.; Van Oppen & Co., Pr. Hayes, Marseilles, 3 cs.; W. J. Byrnes, American Farmer, London. 1 cs.

COLORED PAPER

International F'd'g Co., Hamburg, Hamburg, 18 cs.

STENCIL PAPER

International F'd'g Co., Hamburg, Hamburg, 7 cs.

CARD BOARD

American Express Co., Hamburg, Hamburg, 16 cs.

MISCELLANEOUS PAPER

Coty Processing Co., Normandie, Havre, 2 cs.; Roger & Gallet, Normandie, Havre, 14 cs.; H. H. Strauss, Normandie, Havre, 70 cs.; Jay Madden Corp., Scanyork, Helsingfors, 15 bbls.; U. S. Envelope Co., Venice, Maru Kobe, 9 cs.; Japan Paper Co., Awobasan, Maru Kobe, 58 cs.; Parsons & Whittemore, Inc., American Farmer London, 1 cs.; Steffens Jones Co., Narutu, Maru Kobe, 2 cs.

RAGS, BAGGINGS, ETC.

Van Oppen & Co., Byron, Lisbon, 90 bls. bagging; ———, Cold Harbor, Leith, 78 bls. bagging; Castle & Overton, Inc., Cold Harbor, Dundee, 70 bls. paper stock; E. J. Keller Co., Inc., Cold Harbor, ———, 100 bls. paper stock; E. J. Keller Co., Inc., Lancastria, ———, 22 bls. paper stock; E. J. Keller Co., Inc., Excalibur, ———, 78 bls. paper stock; E. J. Keller Co., Inc., Excalibur, ———, 61 bls. bagging; E. J. Keller Co., Inc., Ingria, ———, 167 bls. paper stock; ———, Ingria, Valencia, 94 bls. paper stock; Bank of N. Y. Trust Co., Ingria, Barcelona, 60 bls. dark cottons; Royal Manfg. Co., American Importer, Manchester, 50 bls. cotton waste; Castle & Overton, Inc., Executive, Piraeus, 146 bls. rags; ———, Executive, Barcelona, 66 bls. dark cottons; ———, Executive, Barcelona, 587 bls. rags; ———, Executive, Barcelona, 104 bls. bagging; ———, Pr. Hayes, Bombay, 235 bls. rags; ———, Pr. Hayes, Bombay, 400 bls. cotton waste; Banco Coml

Italiane Trust Co., Westerland Antwerp, 90 bls. cotton waste; Brandwein Mazur Co., Bordeaux, Maru Kobe, 100 bls. cotton waste; Van Oppen & Co., Black Condor, Rotterdam, 138 bls. bagging ———, Black Condor, Rotterdam, 60 bls. rags; F. Stern, Black Condor, Rotterdam, 124 bls. rags; Amtorg Trading Corp., Scanyork, Leningrad, 1297 bls. rags; Amtorg Trading Corp., Scanyork, Leningrad, 109 bls. flax waste; E. J. Keller Co., Inc., Black Tern, ———, 50 bls. bagging; Loumar Textile By Products Co., Black Tern, Antwerp, 40 bls. jute waste; W. Steck & Co., Black Tern, Antwerp, 120 bls. jute waste; Royal Manfg. Co., Black Tern, Antwerp, 41 bls. jute waste; A. H. Searle, Black Tern, Antwerp, 74 bls. rags; Darmstadt Scott & Courtney, City of Flint, Manchester, 379 bls. bagging; Darmstadt Scott & Courtney, City of Flint, Manchester, 133 bls. paper stock; Irving Trust Co., City of Flint, Manchester, 50 bls. bagging; E. J. Keller Co., Inc., City of Flint, ———, 40 bls. bagging; Loumar Textile By Products Co., City of Flint, Manchester, 79 bls. bagging; A. W. Fenton, Inc., City of Flint, Manchester, 6 bls. bagging; ———, City of Flint, Liverpool, 135 bls. bagging; Mitsui & Co., Ltd., Awobasan, Maru Kobe, 400 bls. cotton waste; ———, Examelia, Algiers, 155 bls. rags; ———, American Farmer, London, 37 bls. rags; J. J. Ryan & Sons, Inc., Spaarndam, Rotterdam, 181 bls. cotton waste; E. J. Keller Co., Inc., Indep. Hall, ———, 405 bls. rags; G. W. Millar & Co., Indep. Hall, St. Nazaire, 129 bls. rags; ———, Hamburg, Hamburg, 78 bls. rags; Chase National Bank, Hamburg, Hamburg, 19 bls. rags.

GLUE STOCK

———, Roma, Trieste, 320 bags hide glue; ———, Hamburg, Hamburg, 380 bags hide glue; ———, Hamburg, Hamburg, 300 bags bone glue.

CHINA CLAY

English China Clays Sales Corp., Scythia, Liverpool, 190 bags; ———, Scythia, Liverpool, 25 casks.

WOOD PULP

Lagerloef Trading Co., Kentucky, Kemi, 6975 bls. sulphite, 1171 tons; Lagerloef Trading Co., Kentucky, Kemi, 442 bls. sulphite, 73 tons; Perkins Goodwin & Co., Consul Olsson, Sundsvall, 3600 bls. sulphate, 600 tons; Stora Kopparberg Corp., Consul Olsson, Skutskar, 1805 bls. dry pulp, 360 tons; Pagel Horton & Co., Inc., Consul Olsson, Gefle, 250 bls. sulphite, 50 tons; Pagel Horton & Co., Inc., Consul Olsson, Gefle, 750 bls. sulphate, 150 tons; Tradesmans Natl. Bank Trust Co., Consul Olsson, Gefle 375 bls. sulphate, 86 tons; Tradesmans Natl. Bank Trust Co., Consul Olsson, Gefle, 25 bls. sulphite, 5 tons; Brown Bros. Harriman & Co., Consul Olsson, Gefle, 1500 bls. sulphate, 159 tons; Bulkley Dunton & Co., Consul Olsson, ———, 1000 bls. sulphite, 200 tons; Gottesman & Co., Inc., Consul Olsson, Gothenburg, 1800 bls. sulphate; Price & Pierce, Ltd., Hallaren, Stockholm, 450 bls. sulphite; Lagerloef Trading Co., Hallaren, Viipuri, 4051 bls. sulphite; Castle & Overton, Inc., Hallaren, Viipuri, 3556 bls. woodpulp; Gottesman & Co., Inc., Hallaren, Hango, 2550 bls. mechanical pulp; Castle & Overton, Inc., Scanyork, Kotka, 946 bls. sulphite, 188 tons; ———, Scanyork, Gdynia, 336 bls. wood pulp, 50 tons; E. J. Keller Co., Inc., Scanyork, ———, 335 bls. wood pulp, 50 tons; Castle & Overton, Inc., Hamburg, Hamburg, 665 bls. wood pulp, 133 tons; Bank of N. Y. Trust Co., Hamburg, Hamburg, 280 bls. wood pulp, 56 tons; Bulkley Dunton & Co., Kersten Miles, ———, 9075 bls. wood pulp.

WOOD PULP BOARDS

———, Hallaren, Viipuri, 450 rolls; Jay Madden Corp., Scanyork, Kotka, 116 bls., 193 rolls.

ALBANY IMPORTS

WEEK ENDING OCTOBER 26, 1935

Bulkley Dunton & Co., Kersten Miles, ———, 2300 bls. wood pulp.

PORTLAND IMPORTS

WEEK ENDING OCTOBER 26, 1935

Gottesman & Co., Inc., Gonzenheim, Sweden, 500 bls. wood pulp; Bulkley Dunton & Co., Gonzenheim, ———, 125 bls. wood pulp.

BOSTON IMPORTS

WEEK ENDING OCTOBER 26, 1935

Elliott Addressing Machine Co., Bordeaux Maru, Yokohama, 1 cs. paper; Hill & Curtler, Black Condor, Rotterdam, 50 bls. cotton waste; Windsor & Co., Black Condor, Rotterdam, 20 bls. rags; E. Butterworth & Co., Inc., Black Condor, Rotterdam; 10 bls. rags; Bulkley Dunton & Co., Greisheim, ———, 700 bls. wood pulp; Bulkley Dunton & Co., Danwood, ———, 725 bls. wood pulp; E. J. Keller Co., Inc., Cold Harbor, ———, 334 bls. wood pulp.

PHILADELPHIA IMPORTS

WEEK ENDING OCTOBER 26, 1935

———, Cold Harbor, London, 184 bls. paper stock; Jay Madden Corp., Cold Harbor, Hamburg, 969 rolls, 12 bls. wrapping paper; National Vulcanized Fibre Co., Ingria, Valencia, 248 bls. rags; Bank of N. Y. Trust Co., Ingria, Valencia, 108 bls. rags; Philadelphia National Bank, Executive, Barcelona, 805 bls. rags; National Vulcanized Fibre Co., Black Condor, Rotterdam, 509 bls. rags; A. H. Searle, Black Condor, Rotterdam, 180 bls. rags; ———, Black Condor, Rotterdam, 220 bls. rags; G. W. Miller & Co., Black Condor, Rotterdam, 58 coils old rope; Stora Kopparberg Corp., Consul Olsson, Skutspar, 135 bls. dry pulp, 26 tons; Perkins Goodwin & Co., Consul Olsson, Sundsvall, 900 bls. sulphite, 150 tons; Pagel Horton & Co., Inc., Consul Olssen, Husum, 6140 bls. sulphate, 1000 tons; J. Anderson & Co., Consul Olsson Gothenburg, 375 bls. sulphite; E. W. Twitchell, Inc., Consul Olsson, Gothenburg, 28 rolls kraft paper; Perkins Goodwin & Co., Consul Olsson, Gothenburg, 127 bls. kraft pulp, 775 bls. sulphate; Gottesman & Co., Inc., Consul Olsson, Gothenburg, 1140 bls. dry pulp; The Borregaard Co., Inc., Consul Olsson, Gothenburg, 12 pkgs., 219 bls., 2290 rolls paper; Paper House of Pennsylvania, Consul Olsson, Gothenburg, 17 cs. paper; ———, Hallaren, Norrkoeping, 31 bls., 61 rolls paper; Phila. Inquirer, Hallaren, Hallstavik, 538 rolls newsprint; Lagerloef Trading Co., Hallaren, Viipuri, 762 bls. mechanical pulp; Lagerloef Trading Co., Hallaren, Hango, 125 bls. sulphate; J. Anderson & Co., Hallaren, Hango, 600 bls. mechanical pulp; H. Reeve Angel & Co., Inc., Scanyork, Kotka, 178 rolls printing paper; J. W. Hampton Jr. & Co., Scanyork, Kotka, 71 rolls newsprint; Castle & Overton, Inc., Scanyork, 1518 bls. sulphite, 301 tons; Johaneson Wales & Sparre, Inc., Scanyork, Gdynia, 1220 bls. wood pulp, 10 tons; Castle & Overton, Inc., Indep. Hall, Bordeaux, 666 bls. rags; National Vulcanized Fibre Co., Indep. Hall, Bordeaux, 11 bls. rags; E. J. Keller Co., Inc., Indep. Hall, ———, 1018 bls. rags; Castle & Overton, Inc., Indep. Hall, St. Nazaire, 973 bls. rags; National Vulcanized Fibre Co., Indep. Hall, St. Nazaire, 232 bls. rags; Gottesman & Co., Inc., Gonzenheim, Sweden, 1557 bls. wood pulp; Bulkley Dunton & Co., Greisheim, ———, 125 bls. wood pulp; E. J. Keller Co., Inc., Beemsterdyk, ———, 89 bls. rags.

(Continued on page 104)

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New York Market Review

Office of the PAPER TRADE JOURNAL,
Wednesday, October 30, 1935.

Sentiment in the local paper market continues optimistic. Demand for the various standard grades of paper is persistent and supplies are moving into consumption freely. Sales forces of the leading paper organizations are looking forward to the future with confidence. Prices are steady to firm.

The newsprint paper market is still rather involved, due to the action of the Great Northern Paper Company in setting a price for next year considered too low by other leading interests in the industry. Another disturbing factor in the situation is the proposed sale of Great Lakes to a group of publishers.

Trading in the fine paper market is brisk. Demand for book, cover, bond and ledger papers is well sustained. Prices remain steady. Tissues are seasonally active. The coarse paper market is sharing the general improvement in business. Kraft wrapping paper is in excellent request.

Mechanical Pulp

The position of the ground wood pulp market is slightly better. Manufacturing operations in the United States, Canada and abroad are still practically keyed to consumption and accumulations at the mill are not excessive. Prices are holding to previously quoted levels, in most instances.

Chemical Pulp

Steadiness prevails in the chemical pulp market. The various domestic and imported grades are exhibiting a strong undertone. Offerings of kraft pulp are rather scarce, with the result that prices continue firm. Other grades are holding to schedule, without difficulty.

Old Rope and Bagging

The old rope market is showing signs of improvement. Demand for domestic and foreign old manila rope is fairly active. Mixed strings are steadier. The bagging market is displaying strength. Demand for both scrap and gunny bagging is good, while roofing bagging is in seasonal request.

Rags

Paper mill interest in the domestic rag market is more in evidence. New cotton rags are firmer, especially No. 1 white shirt cuttings which, with other grades, are also in request for export. Demand for roofing grades is fairly satisfactory for the time of year. No radical changes are reported in the imported rag market.

Waste Paper

The paper stock market is steadier than of late. Board mill demand for the lower grades of waste paper is fairly heavy. Quotations on strictly folded news and No. 1 mixed papers remain unchanged. The higher grades of waste paper are moving in good volume. Ledger stock prices are slightly higher.

Twine

Conditions in the local twine market are favorable. Demand for the various varieties is well up to the average for the season, and ahead of last year's record. Recently advanced quotations on both soft and hard fiber twines are maintained, and reports of concessions are infrequent.

IMPORTS OF PAPER AND PAPER STOCK

(Continued from page 102)

CAMDEN IMPORTS

WEEK ENDING OCTOBER 26, 1935

Lagerloef Trading Co., Hallaren, Viipuri, 5389 bls. sulphate.

BALTIMORE IMPORTS

WEEK ENDING OCTOBER 26, 1935

National City Bank, Ingria Valencia, 348 bls. rags; Congoleum Nairn Co., Ingria, Barcelona, 180 bls. rags, Congoleum Nairn Co., Ingria Barcelonia, 120 bls. dark cottons; E. Butterworth & Co., Inc., Black Tern, Antwerp, 91 bls. bagging; Congoleum Nairn Co., Black Tern, Antwerp, 660 bls. bagging; W. H. Masson, Black Tern, Antwerp, 58 coils old rope; ———, City of Flint, Manchester, 10 bls. paper stock; E. Butterworth Co., Inc., City of Flint, Manchester, 35 bls. paper stock; Certainteed Product Corp., Indep. Hall, Bordeaux, 39 bls. rags; Congoleum Nairn Co., Indep. Hall, Bordeaux, 683 bls. rags; Congoleum Nairn Co., Indep. Hall, St. Nazaire, 114 bls. rags; Bulkley Dunton & Co., City of Norfolk, ———, 300 bls. wood pulp.

NEWPORT NEWS IMPORTS

WEEK ENDING OCTOBER 26, 1935

Bank of Montreal, Humberarm, Cornerbrook, 8062 rolls newsprint.

NORFOLK IMPORTS

WEEK ENDING OCTOBER 26, 1935

Loumar Textile By Products Co., Black Tern, Antwerp, 89 bls. bagging; ———, Black Tern, Antwerp, 201 bls. bagging; Irving Trust Co., City of Flint, Manchester, 231 bls. rags.

MONTREAL IMPORTS

WEEK ENDING OCTOBER 26, 1935

Gottesman & Co., Inc., Agra, Sweden, 21,135 bls. wood pulp; Gottesman & Co., Inc., Titania, Sweden, 4350 bls. wood pulp.

Now Acer, Walsh & Co., Inc.

John H. A. Acer, president of Acer, McLernon & Co., Ltd., Montreal and Quebec, and James F. Walsh, formerly vice president of Bermingham & Prosser Co., Inc., New York, announce the formation on October 1, 1935 of Acer, Walsh & Co., Inc. to manufacture and distribute paper. The new concern will have offices at 475 Fifth avenue, New York.

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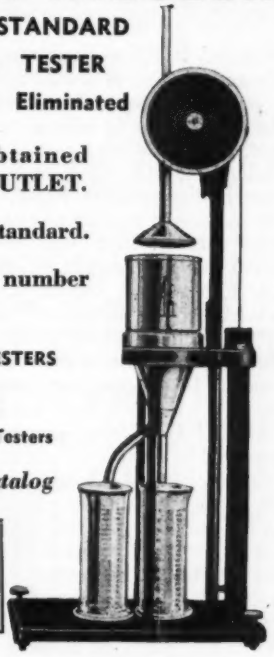

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Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, October 30, 1935.

BLANC FIXE.—Business in the blanc fixe market is fairly active. Prices are holding to formerly quoted levels. The pulp is selling at from $42.50 to $45 per ton, in bulk; while the powder is offered at from 3½ to 3¾ cents per pound, in barrels, at works.

BLEACHING POWDER. — The bleaching powder market is displaying strength. Demand for this product is fairly persistent and supplies are moving into consumption in good volume. Bleaching powder is quoted at from $1.90 to $2.15 per 100 pounds, in drums, at works.

CASEIN.—The casein market is firmer. Domestic standard ground is quoted at 13 and finely ground at 13½; French standard ground at 14 and finely ground at 14½; Argentine standard ground at 13¾ and finely ground at 14¼ cents per pound, all in bags, car lot quantities.

CAUSTIC SODA.—Demand for caustic soda is improving. The contract movement is fairly heavy. Prices remain unchanged. Solid caustic soda is quoted at from $2.60 to $3.10; while the flake and ground are selling at from $3 to $3.05 per 100 pounds, at works.

CHINA CLAY.—Steadiness prevails in the china clay market. Contract shipments are moving freely. Imported china clay is still quoted at from $13.50 to $21 per ton, ship side; while domestic paper making clay is selling at from $6.50 to $12 per ton, at mine.

CHLORINE.—The chlorine market is exhibiting a strong undertone. Prices are holding to previously quoted levels, without difficulty. Chlorine is quoted at from $2 to $2.40 per 100 pounds, in tanks, or multi-unit cars, in ton lots, or over, at works.

ROSIN.—The rosin market is firm. Paper making gum rosin is now quoted at $4.75 and wood rosin at $4.75 per 280 pounds, gross weight, in barrels, at Savannah. Seventy per cent rosin size is selling at $2.67½ per 100 pounds, in tank cars, at works.

SALT CAKE.—Conditions in the salt cake market are favorable. Prices are steady and unchanged. Salt cake is quoted at from $12 to $13; and chrome salt cake at from $11 to $12 per ton, at works. Imported salt cake is selling at from $12 to $13 per ton, ship side.

SODA ASH.—The soda ash market is fairly buoyant. Supplies are moving into consumption in good volume. Prices remain unchanged. Quotations on soda ash, in car lots, at works, per 100 pounds, are still as follows: in bulk, $1.05; in bags, $1.20; and in barrels, $1.50.

STARCH.—Paper mill demand for starch is brisk. The contract movement is normal for the time of year. Prices remain unchanged. Special paper making starch is quoted at $3.59 per 100 pounds, in bags; and at $3.86 per 100 pounds, in barrels, at works.

SULPHATE OF ALUMINA.—The sulphate of alumina market is practically marking time. Prices are holding to schedule. Commercial grades are quoted at from $1.35 to $1.50; while iron free is selling at from $1.90 to $2.05 per 100 pounds, in barrels, at works.

SULPHUR.—The sulphur market continues steady. Suphur is quoted at $18 per long ton, on orders of 1,000 tons, or over, on yearly contracts; and at $20 per ton on any smaller quantity over that period. On spot and near by car loads, the quotation is $21 per ton.

TALC.—Trading in the talc market is mainly routine. The contract movement is fairly good. Prices remain unchanged. Domestic talc is quoted at from $16 to $18 per ton, at eastern mines; while imported talc is selling at from $23 to $30 per ton, on dock.

Market Quotations

Paper

(F. o. b. Mill)

Ledgers	6.50	@	—
Bonds	6.00	@	—
Index	6.00	@	—
Writings—			
Extra Superfine	6.50	@	—
Superfine	6.25	@	—
Tub sized	5.75	@	—
Engine sized	5.50	@	—
Book, Cased—			
S. & S. C.	5.35	@	5.75
S. & S. C. Litho.	5.60	@	6.00
M. F.	5.10	@	5.50
Coated and Enamel	5.90	@	6.55
Coated Litho	5.90	@	6.55
Tissues—Per Ream—			
White No. 1	.82½	@	.85
White No. 2	.67½	@	—
Anti-Tarnish M. G. only	1.00	@	—
Colored	.85	@	—
Kraft	.70	@	—
Manila	.67½	@	.70
Manila—			
No. 1 Jute	9.00	@	9.25
No. 2 Jute	7.75	@	8.50
No. 1 Wood	4.00	@	5.25
No. 2 Wood	3.50	@	4.00
Butchers	4.00	@	4.50
Fibre Papers—			
No. 1 Fibre	4.25	@	5.50
No. 2 Fibre	4.00	@	4.75
Common Bogus	1.50	@	3.00
Screenings	2.50	@	3.50
Glassine—			
Bleached	.11	@	—
Unbleached	.09	@	—

(The following Quotations are Delivered New York)

News, per ton—			
Roll, contract	40.00	@	—
Rolls, spot	40.00	@	—
Sheets	45.00	@	—
Kraft—			
No. 1 Northern	4.12½	@	4.75
Standard	4.00	@	—
Southern	3.87½	@	—
Boards—per ton—			
News	39.00	@	41.50
Chip	37.50	@	40.00
Sgl. Mla. Ll. Chip	42.50	@	45.00
Jute Lined Chip	42.50	@	45.00
Kraft- Liners	52.50	@	—
White Patent Coated	55.00	@	57.50
Binders Boards	67.00	@	75.00

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	21.00	@	22.00
Dry	21.00	@	22.00
(F. o. b. Mill)			
No. 1 Domestic and Canadian	18.00	@	24.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Division 1	2.60	@	—*
Division 2	2.55	@	—*
Division 3	2.50	@	—*
Prime Qualities—			
Class 1. All Prime Easy Bleaching	2.05	@	—*
Other Than Easy Bleaching—			
Class 2. Higher than Standard	2.00	@	—*
Class 3, Standard	1.95	@	—*
Class 4, Lower than Standard	1.90	@	—*
(On Dock, Atlantic Ports)			
Kraft No. 1	1.75	@	1.80
Kraft No. 2	1.60	@	1.70
(F. o. b. Pulp Mill)			
Kraft Domestic	1.75	@	1.80
(Delivered)			
Soda Bleached	2.50	@	—

* Add 60 Cents per short ton, dock charges, for Albany; $2.00 for Lake Ports East and $3.00 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1.	6.50	@	6.75
Silesias No. 1	4.50	@	4.75
New Unbleached	7.00	@	7.25
New Soft Blacks	3.00	@	3.25
Blue Overall	4.75	@	5.00
Fancy	2.50	@	2.75
Washables	1.90	@	2.15
Mixed Khaki Cuttings	3.00	@	3.25
O. D. Khaki Cuttings	3.75	@	4.00
Men's Corduroy	1.75	@	1.85
New Mixed Blacks	2.50	@	2.75

Old Rags

White, No. 1—			
Repacked	3.00	@	3.50
Miscellaneous	2.75	@	3.25
White, No. 2—			
Repacked	1.75	@	2.25
Miscellaneous	1.50	@	1.75
Thirds and Blues—			
Repacked	1.75	@	1.85
Miscellaneous	1.45	@	1.55
Roofing Rags—			
No. 1	1.55	@	1.60
No. 2	1.35	@	1.40
No. 3 (Bagging)	1.25	@	1.30
No. 4	.95	@	1.00
No. 5A	.90	@	1.00

Foreign Rags

New Rags

New Dark Cuttings	2.00	@	2.25
New Mixed Cuttings	1.80	@	1.90
New Light Silesias	3.75	@	4.00
Light Flannelettes	4.00	@	4.25
Unbleached Cuttings	Nominal		
New White Cuttings	6.50	@	6.75
New Light Oxfords	3.25	@	3.50
New Light Prints	2.75	@	3.00

Old Rags

No. 1 White Linens	7.50	@	8.00
No. 2 White Linens	6.50	@	7.00
No. 3 White Linens	4.50	@	5.00
No. 4 White Linens	2.25	@	2.50
No. 1 White Cotton	4.25	@	4.75
No. 2 White Cotton	3.25	@	3.75
No. 3 White Cotton	2.50	@	2.75
No. 4 White Cotton	1.90	@	2.15
Extra Light Prints	2.00	@	2.25
Ord. Light Prints	1.75	@	1.85
Med. Light Prints	1.55	@	1.65
Dutch Blue Cottons	2.00	@	2.25
French Blue Linens	2.30	@	2.40
German Blue Linens	2.15	@	2.25
German Blue Cottons	1.70	@	1.80
Checks and Blues	1.70	@	1.80
Linsey Garments	1.95	@	2.05
Dark Cottons	1.50	@	1.60
Old Shopperies	1.00	@	1.05
New Shopperies	1.25	@	1.35
French Blues	2.00	@	2.25

Old Rope and Bagging

(Prices to Mill f. o. b. N. Y.)

Gunny No. 1—			
Foreign	1.80	@	1.90
Domestic	1.60	@	1.70
Wool Tares, light	1.65	@	1.70
Wool Tares, heavy	1.80	@	1.90
Bright Bagging	1.65	@	1.70
Manila Rope—			
Foreign	1.85	@	2.00
Domestic	1.75	@	2.00
Mixed Strings	.85	@	1.00
New Burlap Cut	2.00	@	2.25
Hessian Jute Threads—			
Foreign	2.60	@	2.75
Domestic	2.80	@	3.00

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	2.45	@	2.55
Ordinary Hard White No. 1	2.10	@	2.15
Hard White No. 2	1.90	@	2.00
Soft White No. 1	1.75	@	1.85
Flat Stock—			
Stitchless	.65	@	.75
Over issue Mag	.65	@	.75
Solid Flat Book	.55	@	.60
Crumpled No. 1	.35	@	.40
Solid Book Ledger	1.50	@	1.65
Ledger Stock	.85	@	.90
New B. B. Chips	.30	@	.35
Manilas—			
New Env. Cut	1.70	@	1.80
New Cuttings	1.35	@	1.45
Print	Nominal		
Bogus Wrapper	.40	@	.50
Container	Nominal		
Old Kraft Machine—			
Compressed bales	1.10	@	1.20
News—			
No. 1 White News	1.45	@	1.50
Strictly Overissue	.50	@	.55
Strictly Folded	.32½	@	.35
No. 1 Mixed Paper	.25	@	.27½

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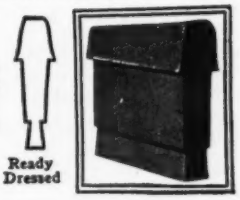

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Twines

(F. o. b. Mill)

(Soft Fibre)

Coarse Polished—

India	.12¾	@	.15¼
Belg. White Hemp	.13¾	@	.14¼
India Compress	.13¼	@	.13¾

Fine Polished—

Fine India	.21	@	.23
Special	.19	@	.21

Unpolished—

Box	.11½	@	.12
Paper Makers	.09	@	.13½
Tube Rope	.09½	@	.14½
Wall Paper	.10½	@	.14
Wrapping	.14½	@	.20½
Special	.14½	@	.15
Soft Fiber Rope	.11¾	@	.12¼

(Hard Fibre)

Bond	.11	@	.19½
Anchor	.10½	@	.12

CHICAGO

Paper

(F. o. b. Mill)

Rag Bond	.12	@	.50
Water Marked Sulphite Bond	.06¾	@	.11
Sulphite Bond	.05½	@	.11
Superfine Writing	.18	@	.24
No. 1 M. F. Book	.06½	@	.07¾
No. 2 M. F. Book	.05¼	@	.06¼
No. 1 S.&S.C. Book	.06¾	@	.07¾
No. 2 S.&S.C. Book	.05¼	@	.06½
Coated Book	.07	@	.12
Coated Label	.07	@	.08½
No. 1 Manila	.04¼	@	.05¾
No. 1 Fibre	.04¾	@	.05¼
No. 2 Manila	.04¼	@	.04¾
Butcher's Manila	.03¼	@	.03¾
No. 1 Kraft	4.75	@	5.00
Southern Kraft	3.88	@	4.25
No. 2 Kraft	3.88	@	4.25
Wood Tag Boards	.04¼	@	.06¼
Sulphite Screenings	.03	@	.03¾
Manila Tissue	.05¾	@	.07
White Tissue	.07	@	.09

(Delivered Central Territory)

News, per ton—			
Rolls, contract	41.00	@	—
Sheets, open	46.00	@	48.50
Boards, per ton—			
Plain Chip	46.50	@	—
Solid News	50.00	@	—
Manila Lined Chip	55.00	@	—
Patent Coated	65.00	@	—
Container Lined—			
85 Test, per 1000 sq. ft.			1.70
100 Test, per 1000 sq. ft.			1.85

Old Papers

(F. o. b. Chicago)

Shavings—

No. 1 White Envelope Cuttings	1.70	@	2.00
No. 1 Hard White	1.40	@	1.65
No. 1 Soft White	1.25	@	1.50
Ledger & Writings	.70	@	.80
Solid Books	.60	@	.70
Blanks	1.00	@	1.05
Krafts	.80	@	.90
New Kraft Cuts	1.20	@	1.30
Manila Env. Cuts	1.25	@	1.30
Ex. No. 1 Manila	.90	@	1.00
Print Manila	.40	@	.50
Overissue News	.40	@	.45
Old Newspapers—			
No. 1	.30	@	.35
No. 1 Mixed Paper	.25	@	.30
Roofing Stocks—			
No. 1	30.00	@	—
No. 2	28.00	@	—

PHILADELPHIA

Paper

(Delivered Philadelphia)

Bonds	.05-9/10	@	.38
Ledgers	.06-9/10	@	.40
Writings—			
Fine No. 3	.05	@	.06
Superfine	.10	@	.12
Extra Fine	.15	@	.26
Fine	.15	@	.26
Fine, No. 2	.10	@	.25
Book, M. F.	.05¼	@	.06¼
Book, S. S. & C.	.05½	@	.07½
Book, Coated	.06½	@	.09
Coated Lithograph	.06¼	@	.08½
Label	.07	@	.11
No. 1 Jute Manila	6.25	@	—
Manila Sul., No. 1	5.25	@	—
Manila No. 2	3.75	@	—
No. 1 Kraft	5.00	@	—
Southern Kraft	4.75	@	—
Common Bogus	.03	@	—
News Print Rolls	40.00	@	—
Straw Board	40.00	@	45.00
News Board	40.00	@	—
Chip Board	37.50	@	—
Wood Pulp Board	70.00	@	85.00
Binder Boards—			
No. 1, per ton	75.00	@	80.00
No. 2, per ton	70.00	@	75.00
Carload lots	65.00	@	70.00
Tarred Felts—			
Regular	52.25	@	54.25
Slaters (per roll)	.84	@	.94
Best Tarred, 1-ply (per roll)	1.95	@	2.10
Best Tarred, 2-ply (per roll)	1.40	@	1.75
Best Tarred, 3 ply	2.00	@	2.25

Domestic Rags (New)

(Price to Mill, f. o. b. Phila.)

Shirt Cuttings—			
New White, No. 1	.06¼	@	—
New White, No. 2	.04½	@	—
Light Silesias	.04	@	—
Silesias, No. 1	.04	@	—
Black Silesias, soft	.03	@	—
New Unbleached	.06	@	—
Washable, No. 1	.01¾	@	—
Blue Overall	.04	@	—
Cottons—According to grades—			
Washable, No. 2	.02½	@	.04¼
New Blue	.01½	@	—
Fancy	.01½	@	—
New Black Soft	.02	@	.03¼
New Light Seconds	.04	@	—
New Dark Seconds	1.10	@	—
Khaki Cuttings—			
No. 1 O. D.	.03	@	.04
No. 2 Mixed	.03	@	.04
Corduroy	.01¾	@	—
New Canvas	.03½	@	.04½
New Black Mixed	.02¼	@	.02½

Domestic Rags (Old)

White No. 1—			
Repacked	3.25	@	3.50
Miscellaneous	2.00	@	3.00
Thirds and Blues—			
Miscellaneous	1.50	@	1.75
Repacked	2.25	@	2.50
Black Stockings (Export)	4.00	@	4.50
Roofing Stock—			
Foreign No. 1	.90	@	1.10
Repacked	1.30	@	1.50

Bagging

(F. o. b. Phila.)

Gunny, No. 1—			
Foreign	1.50	@	—
Domestic	1.75	@	2.00
Manila Rope	2.50	@	—
Sisal Rope	.75	@	1.00
Mixed Rope	1.00	@	1.10
Scrap Burlaps—			
No. 1	1.75	@	1.80
No. 2	.80	@	.90
Wool Tares, heavy	2.75	@	—
Mixed Strings	1.00	@	1.10
No. 1 New Light Burlap	2.25	@	2.50
New Burlap Cuttings	2.00	@	2.25

Old Papers

(F. o. b. Phila.)

Shavings—			
No. 1 Hard White	2.25	@	2.30
No. 2 Hard White	1.90	@	2.00
No. 1 Soft White	1.80	@	1.85
No. 2 Soft White	1.25	@	1.30
No. 1 Mixed	—	@	.75
Solid Ledger Stock	1.50	@	1.60
Writing Paper	1.00	@	1.10
No. 1 Books, heavy	.55	@	.60
No. 1 New Manila	1.50	@	—
Print Manila	.50	@	.60
Container Manila	—	@	.50
Old Kraft	1.00	@	—
No. 1 Mixed Paper	—	@	.30
Straw Board Chip	.40	@	—
Binders Board Chip	.40	@	—
Corrugated Board	.55	@	—
Overissue News	.60	@	—
Old Newspapers	.40	@	—

BOSTON

Paper

(F. o. b. Mill)

Ledgers—			
Sulphite	.06	@	.12½
Rag Content	.12	@	.30
All Rag	.36	@	.52½
Bonds—			
Sulphite	.07¼	@	.11
Rag Content	.12	@	.30
All Rag	.36	@	.65
Writings	.06½	@	.20
Superfines	.11	@	.31
Book, Super	.06	@	.09
Book, M. F.	.05½	@	.08½
Book, Coated	.08½	@	.18
Coated Litho	.09	@	.12
Label	.09½	@	.15
Jute Manila No. 1	.11	@	.13
Manila, Sul. No. 1	.04¼	@	.06½
Manila, Sul. No. 2	.03¾	@	.04½
No. 1 Kraft	.04¾	@	.05
No. 2 Kraft	.04¼	@	.04¾
(F. o. b. Boston)			
Southern Kraft	.03¾	@	.04¼
(F. o. b. destination in carload lots, f. o. b. mill in less than carload lots)			
Common Bogus	.02	@	.02¾
(Delivered New England points)			
News Print Rolls	39.50	@	—
Straw Board, rolls	.009	—	@35.00
Straw Board in Sheets, basis 35s to 70s	—	@	40.00
Filled News Board	40.00	@	45.00
Chip Board	37.50	@	40.00
Chip Board (Creasing)	37.50	@	40.00
Single Manila Lined Chip	47.50	@	52.50
Single White, Patent Coated News Board (Bender)	55.00	@	65.00
Wood Pulp Board	70.00	@	75.00
Binder Boards (Standard Grade)	67.00	@	75.00

Old Papers

(F. o. b. Boston)

Shavings—			
No. 1 Hard White	2.00	@	2.20
No. 1 Soft White	1.75	@	1.90
No. 2 Mixed	.75	@	.80
Solid Ledger Books	1.40	@	1.50
Overissue Ledger Stock	1.15	@	1.30
Mixed Ledgers	.85	@	.90
No. 1 Books, heavy	.55	@	.65
No. 1 Books, light	.50	@	.60
Crumpled Stitchless Book Stock	.50	@	.60
Manila Env. Cuttings	1.30	@	1.40
No. 1 Old Manila	.60	@	.65
White Blank News	1.25	@	1.30
No. 1 Kraft	1.10	@	—
Mixed Papers	.22½	@	.25
Print Manila	.50	@	.60
Container Manilas	.27½	@	—
Old Newspapers	.25	@	.27½
Overissue News	—	@	.35
Box Board Chips	—	@	.25
Corrugated Boxes	.35	@	.37½
Screening Wrappers	.40	@	.45

Bagging

(F. o. b. Boston)

Manila Rope—			
Foreign	2.00	@	—
Domestic	2.00	@	—
Transmission Rope	.90	@	1.00
Jute Rope	1.50	@	1.60
Jute Carpet Threads	.65	@	.70
Gunny No. 1—			
Foreign	1.90	@	—
Domestic	1.65	@	—
Bleachery Burlap	4.00	@	4.50
Scrap Burlap—			
Foreign	1.85	@	1.90
Domestic	1.60	@	1.75
Scrap Sisal	1.50	@	1.60
Scrap Sisal for Shredding	1.60	@	1.75
Wool Tares, heavy	1.75	@	1.85
New Burlap Cuttings	1.75	@	1.90
Australian Wool Pouches	2.50	@	2.75
Heavy Baling Bagging	2.00	@	2.25
Paper Mill Bagging	1.25	@	—
Bagging No. 2	.90	@	.95

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints	.01¾	@	.02
New White No. 1	.06	@	.06¼
New White No. 2	.04	@	.04¼
Silesias No. 1	.04½	@	—
New Black Silesias	.02½	@	.03
Soft Unbleached	.06½	@	.06¾
Blue Cheviot	—	@	4.65
Fancy	.0195	@	.021
Washable	.0165	@	.0170
Cottons—According to grades—			
Blue Overalls	.04½	@	.04¾
New Black, soft	.04	@	.04¾
Khaki Cuttings	.03½	@	.03¾
O. D. Khaki	.03	@	.03¾
Corduroy	.01¾	@	.02
New Canvas	—	@	.05
B.V.D. Cuttings	—	@	.06¼
Paper Mill Bagging	1.10	@	1.25

Domestic Rags (Old)

(F. o. b. Boston)

Canvas	.04½	@	—
White No. 1—			
Repacked	—	@	2.75
Miscellaneous	2.50	@	2.75
White No. 2—			
Repacked	1.90	@	2.00
Miscellaneous	2.00	@	2.25
Twos and Blues	1.50	@	2.00
Thirds and Blues—			
Repacked	1.37½	@	1.75
Miscellaneous	1.25	@	1.62½
Black Stockings	2.50	@	3.00
Roofing Stock—			
No. 1	1.50	@	1.60
No. 2	1.35	@	1.40
No. 3	1.05	@	1.15

Foreign Rags

(F. o. b. Boston)

Dark Cottons	1.75	@	—
New White Shirt Cuttings	5.50	@	6.00
Dutch Blues	2.25	@	2.50
New Checks & Blues	2.50	@	3.00
Old Fustians	1.90	@	—
Old Linsey Garments	2.10	@	—
New Silesias	4.75	@	—

TORONTO

Paper

(F. o. b. Mill)

Bond—			
No. 1 Sulphite	.11	@	—
No. 2 Sulphite	.08½	@	—
No. 1 Colored	.12	@	—
No. 2 Colored	.09	@	—
Ledgers (sulphite)—			
Ledgers, No. 1	.34½	@	—
Ledgers, No. 2	.25½	@	—
Writing	.09	@	.09½
Book—			
No. 1 M. F. (Carloads)	6.50	@	—
No. 2 M. F. (Carloads)	6.00	@	—
No. 3 M. F. (Carloads)	5.50	@	—
No. 1 S. C. (Carloads)	7.00	@	—
No. 2 S. C. (Carloads)	6.50	@	—
No. 3 S. C. (Carloads)	5.20	@	—
No. 1 Coated and Litho	12.00	@	—
No. 2 Coated and Litho	10.50	@	—
No. 3 Coated and Litho	9.50	@	—
Coated tinted	13.00	@	—
Wrapping—delivered—			
Rag Brown	4.75	@	—
White Wrap	3.50	@	—
"B" Manila	5.25	@	—
No. 1 Manila	5.40	@	—
Fiber	5.40	@	—
Kraft, M. F.	5.90	@	—
Kraft, No. 2	5.40	@	—

(F. o. b. Cars Toronto)

News, per ton—			
Rolls (contract)	39.50	@	—
Sheets	44.50	@	—

Pulp

Ground wood	27.00	@	—
Unbleached Sulphite	42.00	@	—
Book (Class 1)	58.00	@	—
Writing (Class 2)	59.00	@	—
Select (Class 3)	60.00	@	—

Old Waste Paper

(In carload lots, f. o. b. Toronto)

Shavings—			
White Env. Cut	2.00	@	2.30
Soft White	1.60	@	1.90
White Blk. News	1.25	@	1.40
Book and Ledger—			
Flat Magazine and Book Stock (old)	.90	@	1.00
Light and Crumpled Book Stock	.80	@	.90
Ledgers and Writings	1.00	@	1.05
Manilas—			
New Manila Cut	1.25	@	1.40
Printed Manilas	.50	@	.60
Kraft	1.00	@	1.60
News and Scrap—			
Strictly Overissue	.60	@	—
Strictly Folded	.50	@	—
No. 1 Mixed Paper	.40	@	—

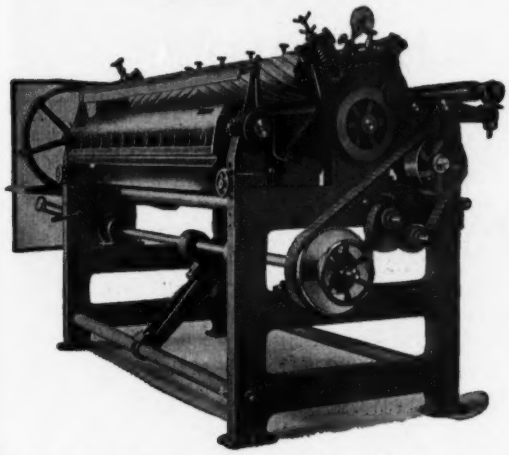
Domestic Rags

(Price to mills, f. o. b. Toronto)

No. 1 White Shirt Cuttings	.06	@	—
Fancy Shirt Cuttings	.02	@	—

MODEL 28

ROLLER BEARING CUTTER



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PAPER TRADE JOURNAL

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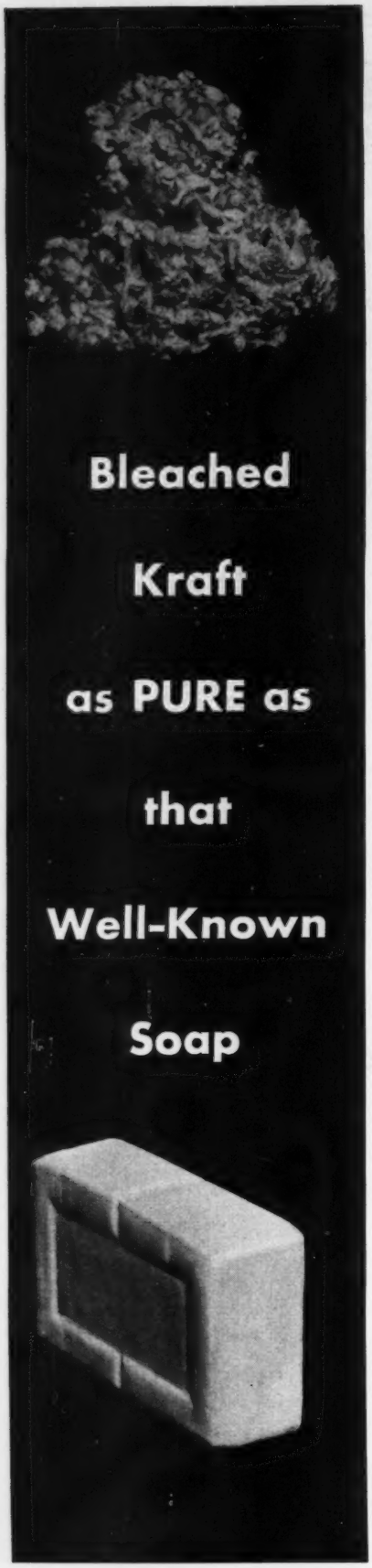
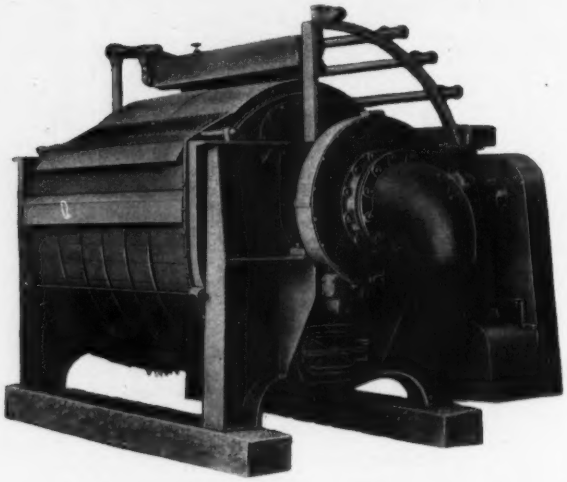


99% of the Chlorine Removed in One Wash by the OLIVER-YOUNG BLEACH WASHER



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